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Materials for the Electrical Industry.

ALTHOUGH the consumption of copper during the year 1926 was on a very large scale, the market was not a very satisfactory one as regards prices. Standard copper at the end of 1925 was about £59 12s. 6d. per ton, whilst the value at the end of last month was only about £56 2s. 6d. In the same period "electro" dropped from £66 to £63 15s.

It was a matter of surprise to many that values should have shown such poor response to an excellent demand, but it has to be remembered that in recent years improved methods of metallurgy have resulted in a cheapening of the cost of output and, indeed, have made possible the working of ores which previously would not have been an economic proposition. However, with a view to stabilising prices, producers in America arranged an organisation entitled Copper Exporters Incorporated, to handle all sales of metal for overseas countries, the United States market being excluded. The association is not confined to American interests, although there is still a certain production which does not come within its scope. Naturally those interested in the metal apprehended a rise in price, and on the eve of the start of the new concern, substantial buying was done by both consumers and dealers, the latter being anxious to secure supplies in view of the expressed intention of the Incorporated Exporters to confine sales to the consuming industries so far as practicable. The result was that trading subsequently underwent a lull and, indeed, the new selling organisation experienced keen competition on the part of dealers. This resulted in anxiety on the part of American producers to secure orders in their own country, the combined effect of these two circumstances resulting in still lower prices. It has to be borne in mind, however, that as the quantities of copper in dealers' hands are limited, and as the stocks of metal which they purchased just prior to the formation of Copper Exporters, Inc., become reduced, the chance of that concern having a greater control over the market is increased.

Whilst there are hopes of improved consumption in Europe in the coming year, the prospects in regard to the United States are a little indefinite as yet, but what

one has to remember is that the price has had a fair fall, and is now at a reasonable level, and with the chance already indicated of the Copper Exporters securing greater control over the market, values should respond to any change for the better in general conditions.

The lead market was disturbed during the year by the incidence of the coal strike. In addition, however, the early part of the year saw the market in a weakening condition owing to the arrival of large supplies from Australia, where stocks had accumulated owing to a shipping strike at the close of 1925. As a result, supplies of the metal in this country have been ample, and whilst Continental consumption was good at one period, the rate of activity on the Continent has declined latterly, resulting in the bulk of the supply being diverted to the United Kingdom. The general result is that a surplus has accumulated here, but as the bulk of this is held in warehouses which do not furnish a return of their stocks, it is impossible to estimate what the total supplies here may be. In any case, however, they seem to be held in strong hands and are not pressed for sale. During last year prices dropped from about £35 10s. to £28 15s., and although a rather better sentiment is expressed, based on the belief that the arrivals here during the first month or two of the year may be on a slightly smaller scale, that the existing stocks will probably be carefully nursed, and that there are fair prospects of a revival in the rate of consumption, the market has nevertheless shown further weakness.

Spelter also saw a decline in values during 1926, prices coming down from about £38 12s. 6d. at the end of 1925 to £32 15s. at the end of last month. Consumption here was interfered with by the coal strike, but while the stoppage at our mines continued, a high rate of consumption was maintained on the Continent. Latterly, however, the rate of industrial activity on the Continent seems to have eased, whilst the consumption in this country has not increased to the extent anticipated. No doubt, however, this is partly on account of slack conditions in galvanised sheets, and a broadening in the demand on the part of galvanisers is to be expected when the inquiry for sheets shows signs of increasing. An important event was the dissolution of the German syndicate of spelter producers. Hitherto the leading smelters in that country had been acting in concert in selling their output, and the news of the break-up of the syndicate naturally had a somewhat depressing effect on the London market. So far, however, no selling pressure has developed on the part of the various concerns which formed component parts of the syndicate, producing interests in that country apparently preferring to hold their metal in the hope of a rally in the market. There is now talk of some further syndicate being formed, but nothing concrete has developed as yet so far as is known. In view of the change in conditions in Germany, it is difficult at present to take a definite view of the outlook. At around present levels, however, the metal market seems fairly moderately priced.

During the first seven months of 1926 rubber quotations fell fairly steadily, following the 1925 boom. However, for the greater part of the year the exportable quota from Malaya and Ceylon was 100 per cent., and with consumption in America considerably below expectations, stocks accumulated in London and in the United States, and rose to the extent of fully 60,000 tons during the year. The restriction scheme was considerably amended at the end of October, and the question of unused coupons was dealt with. The outlook for 1927 is very uncertain, for consumption in the United States, which in 1926 fell far below the estimates, is still most difficult to forecast. Motor-car production at the moment has fallen off, and although a good demand is anticipated in the spring, this may not materialise. Moreover, the powerful "Pool" recently formed in the United States may be strong enough to influence the course of the market. More rapid increase or curtailment of exports is now provided by the restriction scheme according to the price level, and with the reassessment of estates as yet uncompleted, estimates of output are most difficult. Generally speaking, it is anticipated that 1927 will see a larger consumption of rubber and with an impending reduction in the exportable quota to 70 per cent. of standard at the end of January, prices should be maintained at a reasonable level, in spite of the stocks held in London and America. Much, however, depends on whether consumers delay purchasing and so cause a further reduction in the exportable quota at the end of April.

The Location of Power Stations.

THE lines on which electricity supply is developed to meet the electrical needs of a country are influenced very materially by the conditions obtaining in the particular country. What has proved to be an economic proposition in one country—or even in one district of a country—is not in itself a guarantee that similar methods will yield the best economic results elsewhere. Local conditions must always be taken into consideration. This country is fortunate and unique in that most of its electrical load centres are situated on, or closely adjacent to, coalfields. The fact is not always given its due weight when the electrical requirements of the country as a whole are under consideration, although it is really the dominating factor of the whole electricity supply situation. The moral of the old adage that "It does not pay to carry coals to Newcastle" is surely applicable to the problem of this country's electricity supply, for the source of electrical energy, in this country, is coal, and most of the main load centres have their own coalfields.

Other conditions being equal, the obvious location of a power station is at the centre of gravity of the load supplied therefrom, for thus capital and running costs of distribution are kept to the minimum value. From a distribution point of view this is the ideal location, and as the capital cost of distribution is usually more than half the total cost of an undertaking, and the ratio is tending to increase, it follows that before extra cost is incurred in distribution due to locating the station far away from its load centre, the gain due to decreased generation cost should outweigh the increased distribution cost. A school of thought has arisen in the electricity supply world which takes it for granted that the only right policy for generation is to concentrate it in relatively few stations on riverside sites. We have never agreed that that is the only possible policy, for in our opinion, if it were carried out in its entirety, the enhanced distribution costs would far outweigh the gains in generation costs. There are cases where the riverside capital station represents the optimum economic solution, but on the other hand, there are other cases where such a choice could not be justified.

There are many factors affecting the economic location of power stations. The values of some of the factors vary with every case, but the values of certain of the factors are capable of being determined for general application. In this issue we publish an article entitled "River Water—or Cooling Towers?" by Mr. J. N. Waite, M.I.E.E., in which the author examines the effect of using river water for condensing purposes on thermal efficiency, as compared with cooling towers; to this article we would direct special attention, as being a very timely and authoritative pronouncement on this important factor.

A study of the article shows quite clearly that the author, who has had a very extended experience of both classes of station, and has studied the subject exhaustively by actual tests under normal working conditions, holds no brief for either the riverside station or the cooling-tower station, but is solely concerned with arriving at a reasonably accurate estimate of the inherent thermal gain accruing from the use of river water for condensing purposes. The article examines the question in a judicial manner, giving the basic data, and the logical conclusions to be derived therefrom.

The results arrived at, as given in Table III, provide material for serious thought, for the inherent thermal gain due to the use of river water for condensing purposes is considerably smaller than has been generally accepted. It is obvious that the thermal gain alone is not sufficient to pay for locating a power station far from its load centre.

The recent decision of the Liverpool Corporation undertaking, with the approval of the Electricity Commissioners, to extend Lister Drive Station, which uses cooling towers, instead of building a new power station on a riverside site, caused considerable surprise in the supply world, and provoked some criticism. In this case, the cost of a riverside site and of the civil engineering work in connection therewith was the deciding factor. The results shown in the article by Mr. Waite give further support to the view that the decision arrived at was the correct one. The Liverpool undertaking is to be congratulated on thinking for itself and refusing to be led by fashion.

The fact that such undertakings as those at Birmingham, Sheffield, Bradford, and a number of others have pursued the course of locating their power stations as near to the load centres as possible and using cooling towers, in preference to going a long distance afield to obtain sites where river water is available, taken in conjunction with the generating costs of those undertakings, is reasonably satisfactory proof that capital stations can be erected and operated to give economic results without the use of river water for condensing purposes. For every given case there is an economic limit distance from the load centre. In this country, with its many coalfields, the economic distance limit must be relatively small in many cases.

We commend the article to the serious attention of supply engineers as being a lucid and well-reasoned examination of an important factor in the location of power stations.

The Electricity (Supply) Act Reviewed.

THE complete and final text of the Act was issued last week, and to-day we conclude a summary of its provisions; we also begin a critical review of its contents, mainly from the legal standpoint, written at our request by Mr. W. S. Kennedy, who is intimately acquainted with its provisions and, moreover, is a staunch advocate of the Government scheme. Whilst we opposed the Bill during its passage through Parliament, we accept the Act as a fact, and shall endeavour to look on the bright side and direct attention to its good points.

We strongly recommend all managers of electricity supply undertakings to obtain copies of the Act *in extenso*. Many of its provisions, it is clear, relate to the future and will have no direct bearing on the work of the industry for some years to come, but, on the other hand, a close examination of the clauses reveals a number of useful amendments to the previously existing Acts, from 1882 to 1922, which can be availed of at once. The outstanding clause which is of the most immediate importance is, of course, Section 48, "Sale of Fittings," which grants to all local authority undertakers the selling rights which they have so long sought to obtain, subject to agreed safeguards. We hope that no time will be lost in carrying this Section into effect, whilst the E.D.A.-E.L.M.A. campaign is in full swing, and that it will serve as a flywheel to carry on the good work of domestic electrification when the campaign itself has ended. There should be plenty of work for contractors in 1927.

Another useful Section is No. 34, "Power to lop Trees and Hedges," which will facilitate the erection of overhead lines in rural districts, though its provisions are sadly cumbersome, and may lead to tedious delay. Section 42, "Methods of Charge," will hasten the adoption of the two-part tariff which we have so long advocated; that system is fully endorsed by Sections 11 and 51 and the Seventh Schedule, which explicitly prescribe the division of the cost of production and of the price charged for bulk supply under two heads—the fixed kilowatt charges component and the running charges component.

Other amendments of immediate interest will be found in the Schedules by those who take the pains to compare them with the Acts and Schedules to which they refer; moreover, in some respects they are mandatory. The Fifth Schedule restricts the allocation of the net surplus in aid of the local rate in any year to a maximum of 1½ per cent. of the outstanding debt, and after March 31st, 1930, forbids any such allocation unless the reserve fund has been adequately built up. The statutory notice in respect of service lines is reduced from one month to seven days.

Lastly, the Fourth Schedule is of importance to members of the staffs of electricity supply undertakings who fear that the operation of the Act may prove detrimental to their interests.

The Brightness of Illuminating Glassware.

THE Fourth Technical Paper issued by the Illumination Research Committee on the brightness of glassware describes researches made at the request of the British Engineering Standards Association. Eighteen different types of hemispheres and bowls were examined, five being of pot opal, nine of cased opal glass, and the remainder of alabaster ware. In general, 300-watt lamps were used in the 16-in. diameter glassware, 200-watt lamps in the 12-in. and 100-watt lamps in smaller sizes. The conditions thus agreed with usual practice, and it is interesting to observe that the brightnesses recorded are by no means excessive. The average brightness of the glassware is frequently below 1 candle per sq. in., and in only one case (a translucent sphere) did the brightness of any portion of the luminous surface exceed 2 candles per sq. in. The average brightness of the white sky has been commonly assumed as the brightness of objects that can be comfortably contemplated without glare; authorities have accordingly recommended that fittings within the direct range of view should preferably not exceed 3 candles per sq. in. in brightness. It would seem, therefore, that the consumer who utilises good modern diffusing glassware with gasfilled lamps is not likely to go far wrong; and that good modern opal and alabaster bowls in general afford ample protection against the glare from filaments. Another feature pointed out in the report is the even distribution of brightness over the surfaces of the bowls tested. In all but four cases the variation in brightness per inch of surface was within 10 per cent. The Department of Scientific and Industrial Research has again done good service in presenting data on this subject.

Extra-High-Pressure at Bradford.

WE have received particulars of a notable departure from the conventional power-station practice which has been put in hand by the Corporation of Bradford, on the advice of the City Electrical Engineer, Mr. Thomas Roles, M.I.E.E. In brief, Mr. Roles has decided to install a boiler to work at 1,100 lb. gauge pressure, with an evaporation capacity of some 90,000 lb. per hour, the temperature of the steam being 800 deg. F.; this boiler will supply steam to a 2,500-kW turbine, which will exhaust directly into the main steam range of the Valley Road power station. It is anticipated that this combination will result in a saving of 12 per cent. of coal, and the proportions of the plant are such that the output of the alternator driven by this turbine, together with the electrical output derived from the steam handed over to the low-pressure plant, will cover the estimated future base load of the station.

The contract has been entrusted to the English Electric Co., Ltd., which has been conducting experiments on the use of high-pressure steam at its Rugby works for many years with successful results. The boiler will be made for that company by Messrs. Babcock & Wilcox.

We congratulate Mr. Roles and the contractors on their enterprise, which will be watched with interest.

"Creda" Heating and Cooking Appliances.

A recent visit to the New Factory of Credenda Conduits Co., Ltd., near Birmingham, showed how the standardised mass production of domestic electrical apparatus is facilitated by well-laid-out modern plant.

HAVING built up its business on quality rather than the production of cheap lines, the Credenda Conduit Co., Ltd., deserves the well-merited success of its enterprising policy of quantity production of domestic electric heating and cooking apparatus, which has brought its reward by permitting of the introduction of material improvements without involving increased manufacturing costs.

Fig. 1.—A General View of the Sheet-Metal Press Shop.

Commencing with the manufacture of conduit and associated fittings in the City of Birmingham about 1900, the production of electric heating and cooking appliances was later embarked upon in the original Scholefield Street premises, the business being eventually transferred to the Star Works at Aston, and in 1913 the concern became a limited liability company. In 1917 the Heating Department was lodged in separate premises in Avenue Road, where it grew at an embarrassing rate, due largely to the introduction of a new series of cookers, and the lack of extension facilities made a move imperative. A 5½-acre site was accordingly obtained at Oldbury, and the new factory commenced production in May, 1926; notwithstanding the generous allowance of space, however, present indications are that further bays will probably have to be added to certain shops in the near future. The new factory is laid out on modern lines, with north lights, adequate electric light, and central-heating plant: the accompanying illustrations convey some idea of the spaciousness of the principal shops, and it is worthy of note that the showroom and drawing and administrative offices are heated electrically throughout. Electricity is purchased from the Shropshire, Worcestershire, and Staffordshire Electric Power Co., at 5,500 volts, 3 phase, 25 cycles, and transformed in the works sub-station to 400 volts, some of the power being converted to d.c. for welding, electro-plating, and testing purposes.

From the rough stores sheet metal and rough castings, large stocks of which are maintained, are issued to the press and machine shops respectively; the former (fig. 1) is fully equipped with guillotines, both hand and power presses, and a battery of electric spot welders. A part of the well-equipped machine shop is shown in fig. 2; all tools are made on the premises, a large number often being required for the production of one article. The same shop also accommodates the lathes used for spinning copper kettles, a fascinating

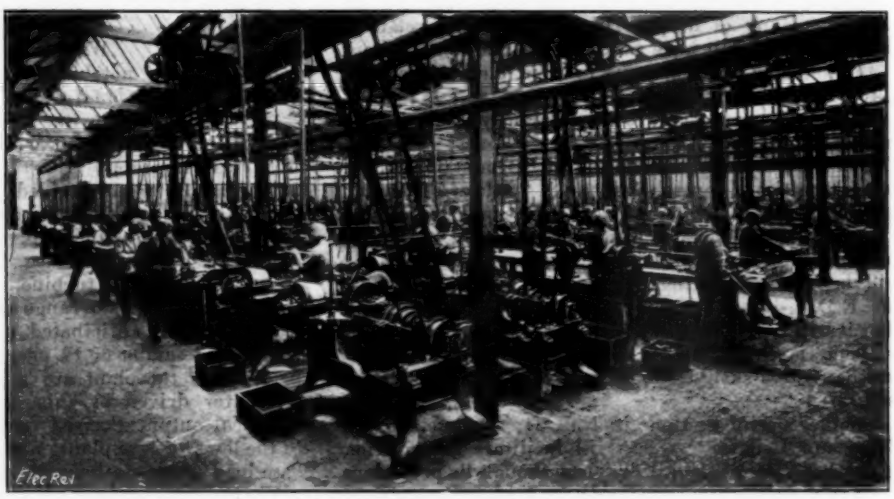


Fig. 2.—A Corner of the Extensive Machine-Tool Bay.

operation to watch. The majority of heating elements are wound by high-speed machines, but it is found desirable in some cases to hand-wind them; to allow for expansion and contraction, as the wire is wound it is passed through crimping rollers. The operatives work in gangs under section leaders, which facilitates the addition or withdrawal of sections as occasion demands. It will be noticed from fig. 3 that the larger cookers are assembled on platforms, while benches are provided in the case of the smaller appliances, their respective heights being so chosen as to prevent back strain and fatigue; the system in vogue is "one man one job," the aim of the management being quantity production, and the assembly process follows through from the finished components stores at one end of the shops to the test section and packing bay at the other end, which is adjacent to and on a level with the main road to facilitate dispatch. The test benches are fitted with conveniently arranged bus-bars, and besides the usual tests, all apparatus is "flashed": large cookers at 2,000 volts, and kettles, irons, and the smaller appliances at 1,000 V. The products of the works are finished in varied styles: a polishing shop, fitted with a system of exhaust fans to protect the workers from dust, is kept busy, and also a large electro-plating section. Extra-heavy-quality copper, nickel, and silver plating is employed, besides oxidised and antique finishes. A feature of the lacquering shop is the electrically-heated hot plates and cupboards for drying, warming and hot lacquering. Steel is "blued" in an oven; the first coats of enamel are applied by dipping and the final coats by spraying. Cookers of several sizes are made, perhaps the most popular model being that illustrated in fig. 4. All heating elements are 3-heat controlled, including the grill, and are of the plug-in variety and easily removable. The oven interior can be withdrawn in one piece for cleaning; it is heated from the sides and bottom, and loaded to 2,000 watts, but the bus-bar arrangement facilitates the addition of extra elements at any time. The grill is loaded to 1,500 watts, as are each of the two boiling plates, of the open pattern, arranged so that spilt liquids cannot harm them. Domestic grills and boiling and warming plates are also manufactured: also a "swing-gate" toaster, so named because the bread holder on each side is hinged to enable the bread to be reversed. The range of irons includes one specially useful when travelling; it is fitted with a special element connector to make it adjustable for any pressure between 100 and 250 volts. The Company's kettles can be provided with a protective device in the form of a tiny fuse, which is melted by excessive heat, and so releases a quick-break switch mechanism located in the false bottom, thus protecting the kettle in the event of its boiling dry.

Fig. 3.—Part of the Main Assembly Department; Large Electric Cookers.

Electric fires, including the bowl and imitation coal varieties, are manufactured in numerous styles and finishes. One of the most graceful in appearance is illustrated in fig. 6; an improved guard is now fitted and a cool, fall-down handle at the back, in addition to the cast ornamental one at the top. Influenced by its hard-wearing qualities, the "Crater" fire bar is fitted to the majority of the Company's fires, a different winding being available for every 10 volts. It is made of tough fireclay with a steel back to prevent breakage; the heavy-resistance spirals are easily renewable, no anchor wires or clips being necessary.

In recent years considerable progress has been made in the manufacture of standardised electric heating and cooking appliances, instead of special types and features, which in the past retarded the introduction of mass methods of production.

The Company's range of manufactures includes electric heating and cooking appliances for hotel and industrial uses, but space considerations do not permit of their description; neither did we have time to inspect the tube mills and conduit fittings department at the Aston Works. Our thanks are due to Mr. P. W. Davis, the managing director, and Mr. F. G. Nesbitt, the sales manager, for their courtesy in showing us over the works, and giving us information which filled our visit with interest.

Fig. 4.—Type C16 Electric Cooker, 6·5 kW.

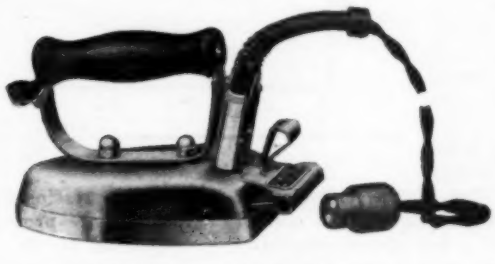


Fig. 5.—A "Creda" Domestic Iron.

Fig. 6.—The "Graceful" Electric Fire.

River Water— or Cooling Towers?

The theoretical gain of thermal efficiency due to the use of river water at 50° F., as compared with water artificially cooled to 75° F., for condensing, is partly neutralised by the difficulty of dealing efficiently with the immense volume of steam at a pressure near 1 inch of mercury (absolute); instead of 10 per cent. the net gain in practice is about 4 or 5 per cent.

By J. N. WAITE, M.I.E.E.

IN view of the obvious trend of legislation regarding electricity supply, the present appears to be a particularly opportune time to review the effect of some of the salient factors affecting the economic location of generating stations. The object of this article is to consider the effect of using river water for condensing purposes on the coal consumption of power stations, compared with the use of cooling towers. This factor, of course, is only one out of many that govern the choice of site, but as it is the one which affects thermal efficiency, which at present seems to be looked upon as a universal panacea for all the more or less mythical ills that the electricity supply industry is deemed to be suffering from, it would appear desirable to attempt to delimit the effect of this factor first. In engineering, as in other walks of life, fashions arise, have their day, and decline. At the present time the leading fashion for power stations is the so-called super-power station, situated where a plentiful natural supply of water is available for condensing purposes. There is no doubt that a power station situated where river or sea water is available for condensing purposes will be able to achieve a higher thermal efficiency than a station using cooling towers, assuming equally efficient plant and operation in both cases. There is also no doubt that, in the majority of cases, the capital costs of a riverside station will be less than for a cooling-tower station. This last statement has a very necessary qualification, for it is conceivable that the exigencies of a riverside site might involve such relatively high costs for foundations, river works, &c., that the advantages of river water might be nullified.

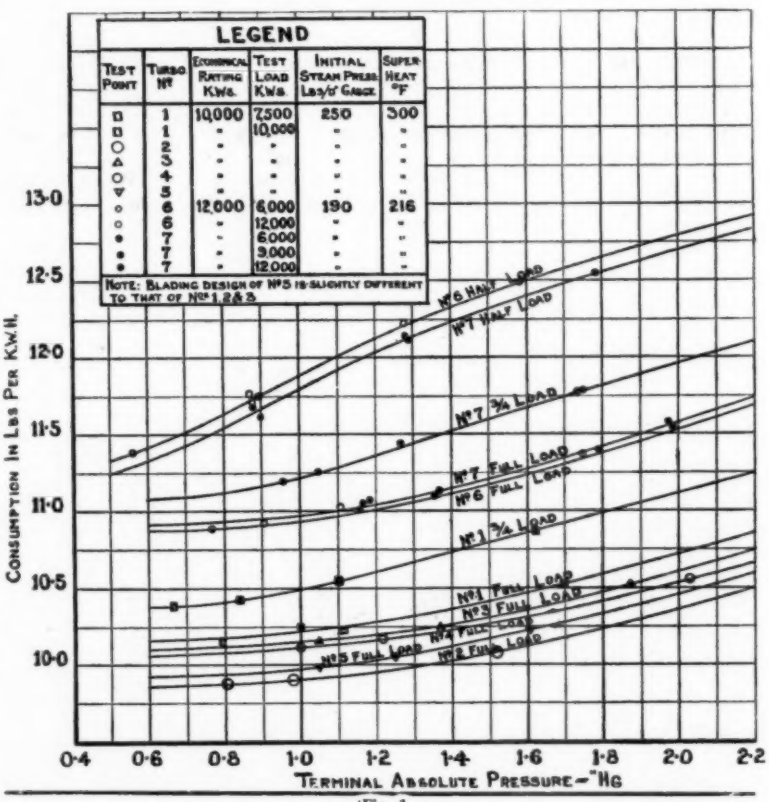


Fig. 1.

It must always be borne in mind that it is the total cost of energy delivered to the consumers that is the criterion of economic power supply, and not merely the cost of generation. The ultra-efficient power station located at a great distance from its load centre may involve a higher total cost for energy delivered to the consumers than would be the case with a less efficient station located nearer to the load centre. It is obviously useless to reduce generating costs if the gain is to be outweighed by increase in transmission and other costs. For all given cases there is an economic distance limit to power transmission. Beyond this limit, in this country, it is cheaper to carry coal than to transmit electrical energy.

The problem of economic electricity supply in this country is not going to be solved solely by the creation of a relatively few large-sized super efficient riverside power stations. Most supply engineers will agree that there are too many small power stations operating now, but at the same time there is a solid body of opinion that the influential supporters of the large-size riverside station fashion, in their enthusiasm for the fashion, are proposing to go much further than is warranted at the present time by the economic facts. Doubtless the necessary antidote will be forthcoming before all the proposals take concrete shape. Before any great changes take place, it should be shown beyond reasonable doubt that not only will the yield be greater than the cost, but also that the ultimate gain will be greater than could be achieved by any other method or scheme.

So far as the writer is aware, no detailed examination of this important question has been published. Many engineers hold definite opinions on this subject, but the majority of the opinions that have been seen or heard by the writer do not coincide with the ascertainable facts. It has been, and still is, often stated that by using river water for condensing purposes instead of cooling towers, the resultant gain is 10 per cent. or over on the coal consumption. The value assigned is far too high, as will appear later. The probable reason for this absurdly high value being assigned to the gain is that it has been calculated on the theoretical increase in adiabatic heat drop with decreased terminal pressure —or higher vacuum—and also to over-estimation of the difference in the vacua realisable under the two sets of conditions.

In well-designed commercial turbines, at full load, the actual gain due to decreased terminal pressure closely follows the theoretical down to about 1.6 inches Hg. absolute (28.4 in. Hg. vacuum). Below this pressure the rate of actual gain rapidly falls away, although the theoretical gain increases. This is illustrated in fig. 1, which gives the test results of seven large-sized modern turbines, all of which are of the two-cylinder type, having double-flow, low-pressure cylinders, which design enables efficient results to be obtained at the l.p. end, and represents about the best result to be expected at the present time. With turbines having a restricted low-pressure blade area, the falling-off will commence higher up the scale of pressure. It will be noted from fig. 1 that at half load the actual gain follows the theoretical much further down the pressure scale than is the case for full load, which is to be expected; but this does not affect the present investigation, for turbines are normally operated at their full economical load.

Before the advent of feed heating by turbine bleeding, there was a very appreciable debit against the gain due to decreased terminal pressure, from the fact that low terminal pressure could only be achieved in conjunction with a low condensate temperature, with the result that the total heat per lb. of steam to the turbine increased with decreased terminal pressure. This debit is practically negatived when bleeding for feed heating is employed, but should be taken into account when bleeding is not used.

Effect of River Water on Coal Consumption.

To arrive at an estimate of the effect of using river water for condensing purposes on coal consumption, the following data are necessary:—

(1) The average temperature of river water.
(2) The average atmospheric temperature.
(3) Cooling tower performance.
(4) Condenser performance.
(5) Actual value of terminal pressure on turbines.

All the foregoing are variables, but from a practical point of view no serious difficulty exists in arriving at representative values from which the effect of using river water on coal consumption can be deduced. Actual cases will probably have different values from those taken as the basis here, but it is contended that the variations met with in practice will not materially alter the main conclusion arrived at.

River water temperature will vary somewhat between different rivers, and also between different places on the same river, mainly according to whether close to the sea or remote therefrom. From records available it would appear that the average temperature of river water is round about 50 deg. F., probably slightly higher. In what follows, the average temperature of river water is taken as 50 deg. F. With this value, full justice will be done to the results from a riverside station.

Official meteorological records from a station in the Midlands give the average of daily *maximum* atmospheric temperatures over a period of 31 years as: dry bulb, 53.5 deg. F.; wet bulb, 49.5 deg. F. These values are the averages of maximum daily temperatures, so that the true average temperature will be appreciably lower. In what follows, the average atmospheric wet-bulb temperature is taken as 45 deg. F., and the average atmospheric humidity as 80 deg. These values do not in any way favour cooling towers.

The real criterion of cooling-tower performance is: how near to the atmospheric temperature can the circulating-water temperature be reduced? The most suitable atmospheric temperature for this purpose is that of the wet bulb, for this takes account of humidity. Cooling-tower performance is affected by design, loading rate, degree of cooling, situation, atmospheric temperature, and humidity. For the purpose in view, the performance required is that corresponding to what can be obtained from a modern well-designed cooling tower when operating at a normal loading rate and doing a normal degree of cooling, with the atmospheric temperature assigned. From a fairly extensive knowledge of cooling-tower performance, and a knowledge of what cooling-tower manufacturers are prepared to guarantee to-day, the writer would assign a value of 75 deg. F. to the temperature of re-cooled water leaving a cooling tower with an atmospheric wet-bulb tempearture of 45 deg. F., and with normal loading and degree of cooling, as representing a good average performance. Therefore, for cooling-tower stations the average circulating inlet-water temperature will be taken as 75 deg. F., as against an average circulating inlet-water temperature of 50 deg. F. for riverside stations.

Condenser performance varies with design, with the efficacy of the air extraction, with the velocity of the circulating water through the tubes, with the loading rate, with the ratio of water to steam, with the state of the tube surfaces, and with the temperature of the inlet circulating water. For the purpose in view, with the exception of the last, all these variables can be neglected, the performance required being the absolute pressure that can be produced with a modern condensing plant under normal conditions of loading and circulating-water quantity, with inlet temperatures of 50 deg. F. and 75 deg. F. respectively. From a fairly wide experience of condenser testing, the writer would assign the respective values to be:—

With 50 deg. F. inlet temperature, 0.9 in. Hg. abs.
With 75 deg. F. inlet temperature, 1.7 in. Hg. abs.

These values can be realised with modern commercial condensing plant, but as the ratio of circulating-water quantity to steam quantity is usually somewhat less with cooling towers than with river water, it is proposed to assign a value of 1.8 in. Hg. absolute as the average condenser absolute pressure in cooling-tower stations. Hence the assigned values for average absolute pressure for the two cases are:—

Average terminal pressure for river-side station, 0.9 in. Hg. abs.

Average terminal pressure for cooling-tower station, 1.8 in. Hg. abs.

The actual influence of terminal pressure on turbine steam consumption varies with design, with the initial steam conditions, and with the degree of terminal pressure. These variations do not affect the comparison to be made, for what is required is the best value that can be realised by a modern turbine over the assigned range of terminal pressure (1.8 to 0.9 in. Hg.). Before considering what is the actual gain to be realised, it may be advantageous to show the theoretical gain due to decreased terminal pressure over the assigned range. This is shown by Table I for a range of initial pressure with constant initial superheat. The result would not be materially affected if a constant initial top temperature were taken instead of constant initial superheat.

TABLE I.

Increase of Adiabatic Heat Drop due to Decreasing Terminal Pressure from 1.8 in. Hg. to 0.9 in. Hg. abs.
Initial Superheat Constant at 250 deg. F.

Initial steam pressure, lb. per sq. in. gauge	250	350	450
	Adiabatic heat. Drop in B.th.u./lb.		
Terminal pressure, 1.8 in. Hg. abs.	422.6	447.0	465.6
Terminal pressure, 0.9 in. Hg. abs.	456.8	480.7	498.8
Increase in heat drop	34.2	33.7	33.2
Theoretical decrease in steam consumption	8.1%	7.5%	7.1%

From Table I it will be noted that the gain due to decreased terminal pressure gets less as the initial pressure increases, ranging from 7.1 per cent. with 450 lb. initial pressure to 8.1 per cent. with 250 lb. pressure, so that if the value assigned to the actual gain is based upon turbine tests at relatively low initial pressure (as will be the case), it represents the best that can be expected.

Actual Gain Less than Theoretical.

As stated earlier, the actual gain for the assigned decrement of terminal pressure is considerably less than the theoretical gain; the reason for this is fairly well known, and may be briefly outlined as follows:—

The efficiency ratio of turbine blading varies with ratio of blade speed to steam speed. With other conditions constant, the volume of steam presented to the last stages of a turbine varies inversely with the terminal pressure (approximately); hence, the steam volume increases at the last stages as the terminal pressure is decreased, and unless the blade area at the exhaust end is increased to that necessary to maintain the maximum efficiency ratio, this ratio will decrease, and the actual gain will be less than the theoretical. With the low terminal pressures obtainable with modern condensing plant using relatively cold river water for circulating purposes, it is not commercially possible to provide a sufficiently large blade area at the turbine exhaust end to utilise efficiently the immense volume of steam presented at low absolute pressure. Therefore, after a certain degree of absolute pressure has been reached, the actual gain gets progressively smaller for each equal decrement of pressure, although the theoretical gain gets progressively larger. The actual degree at which this falling-off commences is a matter of design.

Very few test data are available on the actual influence of terminal pressure on turbine steam consumption. The writer has taken an active interest in this detail point for many years, and in pursuance of that interest has determined the actual value on a fairly large number of turbines of various designs and sizes. The difference between the actual value found and the manufacturers' estimate of it has been very striking indeed on occasions. It is admittedly difficult to determine accurately small differences by measuring large quantities, especially when several variables exist, as is the case with turbo-alternator tests, but given the necessary equipment and experience, it can be done. A number of such tests are given in fig. 1. These are the best results obtained by the writer, who has obtained many others giving much lower results.

The test results in fig. 1 show that the highest gain realised at full load by reducing the terminal pressure from 1.8 in. Hg. to 0.9 in. Hg. was just over 4 per cent. This was with an initial steam pressure of 190 lb. per sq. in. gauge, so that the actual gain is rather less than half the theoretical gain in steam consumption. It may be emphasised that the only value of terminal pressure considered is that pertaining to economic full load, for that will be the load at which turbines will—or at any rate should—operate for the major portion of their running hours. As will be seen from fig. 1, the value of terminal pressure, within the limits under consideration, is considerably higher at half load, showing that although the particular turbine was designed for 0.9 in. Hg. at full load, and was provided with a double-flow low-pressure cylinder, the last stages were over-run at full load and the designed vacuum.

As stated earlier, on a straight turbine, there is a debit against the gain due to decreased terminal pressure in the form of decrease of heat in the condensate. This can be best illustrated by a simple example. From fig. 1 a gain of steam consumption of 4.1 per cent. may be expected by reducing the terminal pressure from 1.8 in. Hg. to 0.9 in. Hg. absolute. On a modern condensing plant the temperature of the condensate leaving the condenser will be about 3 deg. F. lower than the temperature corresponding to the absolute pressure at the top of the condenser, when the plant is giving a good performance. The following Table II shows the thermal gain for a straight turbine—without feed heating by bleeding—for a representative case.

At the present time the practice of feed heating by bleeding is practically standard for all new plant, and then the loss of heat to the condensate due to lower terminal pressure can be made good by bleeding at low pressure, with practically no effect on the steam consumption. This apparent anomaly is due to the last stages of a turbine being normally over-run. Withdrawing a portion of the steam from the last stages has the effect of increasing the efficiency ratio of the last stages, utilising the steam that passes at a higher efficiency, and so causing the effect of bleeding at low pressure to have practically no effect on the turbine

TABLE II.—TURBINE THERMAL GAIN DUE TO DECREASING TERMINAL PRESSURE FROM .8" HG. to 0·9" HG. ABS.

Decrease in steam consumption=4·1%.

Initial steam.			Terminal press: "Hg. abs.	Condensate tempre. °F.	Total heat to turbine B.t.u. per lb.	Steam consumption lb. per kWh.	Heat consumption B.t.u./kWh.	Thermal gain %
Press: Lb. p. sq. in. abs.	Superheat. °F.	Total heat per lb. from 32° F. B.t.u. per lb.						
200	250	1340	1·8	95	1277	10·70	14364	4·1
250	250	1340	0·9	73	1299	10·26	13328	

steam consumption. Hence this debit is to all intents and purposes negatived in modern plant, and need not be considered in the comparison being made, but it was considered advisable to point it out, as cases might arise where it was applicable.

Conclusion.

The result of the foregoing examination of what is the inherent thermal gain to be expected from the use of river water for circulating purposes, as compared with cooling towers, is that the maximum thermal gain, assuming full economical load on turbines, is of the order of 4.0 per cent. The gain will vary with the average load on the turbines. In most cases the actual average load would probably be somewhat lower than the full economical rated load. The following Table III gives the thermal gain corresponding to given average loads.

TABLE III.

Maximum thermal gain from the use of river water for condenser circulating water, compared with the use of cooling towers.

Data: Average atmospheric temperature (wet bulb) 45° F.
Average temperature of re-cooled water leaving cooling towers ... ... 75° F.
Average temperature of river water ... ... 50° F.
Average absolute pressure with:—
Inlet water temperature of 75° F. ... ... 1.8" Hg.
Inlet water temperature of 50° F. ... ... 0.9" Hg.
Value of terminal pressure deduced from fig. 1.

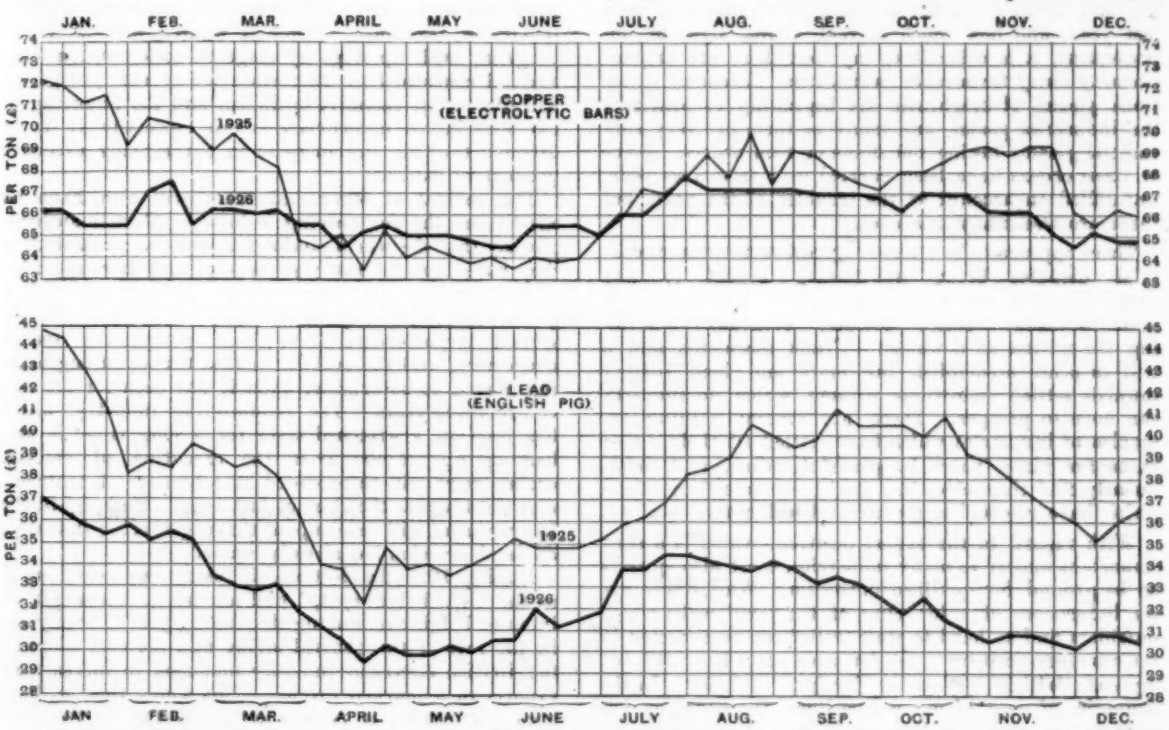
Average turbine load as fraction of full economical load.	Maximum thermal gain from the use of river water. %
1/1	4.0
7/8	4.8
3/4	5.6
5/8	6.4
1/2	7.1

In view of the many variables involved, the examination has been made on broad lines, confined to the main essentials, and deals solely with the effect on thermal efficiency. It is contended that the result presented in Table III is substantially accurate, although it is at variance wtih many opinions on the subject. Special pleading leading to revision of values of the basic data either one way or the other could only alter the data within quite small limits, and the effect on the result would be negligible with the turbines available at the present time.

Copper, Lead and Rubber Prices.

The Past Two Years' Movements Compared.

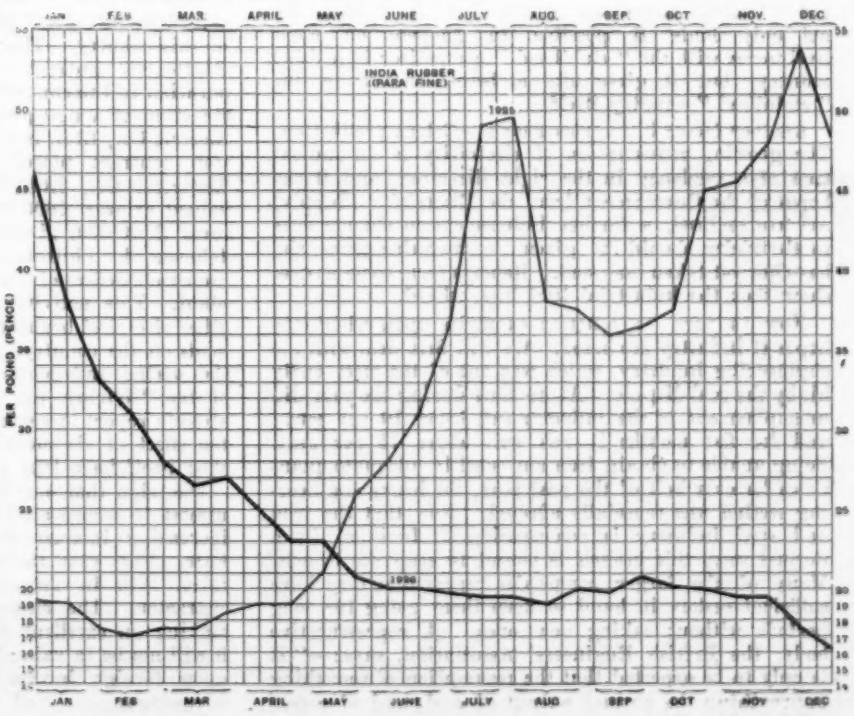
THE curves showing the course of copper, lead, and rubber prices during 1926 which we publish in accordance with our usual practice, indicate greater stability and, generally speaking, lower levels than in 1925.



In the case of copper, the opening price was £6 lower than in 1925, and this feature continued until the end of March, when for three months the curve remained above that of the previous year. From August onward the 1926 prices continued lower in a gently-falling curve, and the end of the year found copper 25s. below the 1925 closing prices. Whereas in 1925 the price of electrolytic bars fluctuated between £63 10s. and £72 5s., last year the upper and lower levels were £67 15s. and £64 10s.

The 1926 lead prices were below those of 1925 throughout the whole of the year, and the general tendency was for the fall to continue. At no time did the price approach within £2 of the corresponding price of 1925, and in October there was a difference of £9 5s. The closing figure was well below the opening price.

In the first few months of the year rubber prices fell swiftly from the giddy heights attained in the preceding year, and during the whole period fell to just over a third of the opening price, with a tendency to fall still further. At one point in 1925 rubber reached the price of 4s. 6d.; at the end of 1926 it stood at 1s. 4½d. Those whose business it is to buy rubber for manufacturing purposes will be thankful that rubber prices have lost their resiliency however much that quality is desirable in the material itself.



The Signs of Trade Revival.

Justified Optimism Manifesting Itself in all Sections of British Industry.

ALL branches of British industry appear to be agreed that 1927 is a year of great promise, and that it will mark an emergence from the slough of despond in which many of them rested during 1926. How much of this optimism is due to a feeling that things could not be much worse than they were last year, and how much to real, visible signs of improvement, it is difficult to say, but there are unquestionably many favourable indications. From all directions gleams of brightness are beginning to penetrate the industrial gloom, and many of them are very substantial gleams taking the shape of firm orders. Some of these orders have been carried over from last year, unfulfilled on account of the troubles of the year, but there are also many new ones.

There appears to be a dawning realisation that industrial disputes bring no lasting benefit to any party involved, but rather loss to the industry itself and to many others besides, eventually harming the nation as a whole. Frank discussion and a will to peace accomplish far more and lead further towards settled conditions without which no industry can hope to prosper. There are several shining examples of industries which have settled all their differences for many years by peaceful means, and consequently find themselves in a healthier state than others which have resorted to strikes and lock-outs.

With regard to the export position, which is a most important matter to many industries, there also appears to be ground for qualified optimism. While there are no indications of a lowering of the tariff walls which outsiders find so hard to scale, relief can be expected in the currency position which for some years has militated against British traders in foreign markets. In the countries of most of our competitors, the currency has appreciated and has been stabilised at a reasonable level. Unhappily, the restlessness of China, Russia, and Mexico are still features in the situation. This has a twofold advantage to the British trader. He not only finds it possible to compete on more level terms with the "stabilised" competitor in a third country, but it gives him a better chance in the "stabilised" country itself.

Another factor in improvement is efficient production. The growing consumption of electricity is an indication of a tendency in the right direction, and if the hopes of the Government from the Electricity (Supply) Act are realised, a further inducement to change over to electricity should be given to manufacturers who have not yet taken that step. Reports from some centres show that the industrial load lags behind.

Now to turn to concrete examples upon which the hopes of industry are based. We will first deal with the engineering industry, which was one of the most badly hit by the coal dispute. At no time during the year did unemployment in the industry fall below 10 per cent., and for five months it was well above 16 per cent. Being unable to obtain iron and steel in adequate quantities for over half of the past year, the heavy engineering section was especially affected. Now that the iron and steel industry is commencing to function in a normal way, this branch is bound to reap the benefit. Many of the larger companies report that they have sufficient orders in hand to keep them going for long periods without taking new ones. A representative body, the British Engineers' Association, says:—"It is only to be expected that the resumption of something approaching the normal output of coal, and of consequential activity in our basic industries in the execution of an accumulation of orders, placed either before or during the coal stoppage, will induce an all-round revival of trade. References have been made in the Press to a prospective boom, but it is to be hoped that there will be no such undesirable phenomenon, with its inevitable reactions. What is wanted now is steady progress, built up stage by stage on solid foundations, and all concerned in the restoration of real prosperity will discourage excessive optimism and the financing of too speculative enterprises, more especially if it be directed towards any increase in our already excessive productive capacity."

The revival of other industries will also have its effect upon the engineering industry. Textile authorities say that the world stocks are lower at present than they have been for many years past, and there must inevitably spring up a demand for cotton and woollen goods. In what may be anticipation of this revival, several large orders have been placed for textile machinery, and the outlook in that branch of engineering is said to be brighter than it has been for the last two or three years. The shipbuilding industry, which has been in a wretched state for a long time, is also looking up. Apart from the execution of held-up orders, work will be provided by a number of contracts received towards the close of last year. Here again the improvement will react upon the engineering industry, as the depression has already reacted.

During 1926 the electrical industry was looked upon as the "one bright spot," and all indications augur an intenser brightness during the coming year. Last year, in the face of the general strike and the coal dispute, the British electrical industry managed to increase its exports to a marked extent. This shows that without such restrictions it is capable of holding its own and more in the world's markets. Quite apart from foreign business, however, the electrical industry is assured of a prosperous year. Already we have learned of orders valued at millions of pounds being placed by customers in this country. The most important of these are the £1,460,000 contract awarded by the Birmingham Corporation to International Combustion, Ltd., for the construction of a new power station, in which the General Electric Co., Ltd., is a large participant; the electrification contract placed with the Metropolitan-Vickers Electrical Co., Ltd., by the Southern Railway Co., valued at over £600,000; and a very large cable order (over £100,000) given by the same company to Messrs. Johnson & Phillips, Ltd. In addition, there are numerous orders of a smaller nature for machinery and plant. This activity is bound to be reflected in the other electrical branches, and we look for increasing loads on the country's power stations brought along by the wiring and contracting industry. The organisers of the "Wiring the Homes of Britain" Campaign already report increased business in many districts, but the effect of six months' propaganda will continue to show itself for a long time to come.

One sign that our manufacturers intend to do their utmost to secure all the trade that is available is the increasing interest shown in the British Industries Fair. This year the display will surpass all previous fairs, both in magnitude and in its representative character. The electrical industry in particular is making an excellent effort, and we are convinced that it will not be in vain; its moral and psychological effects upon foreign buyers will not be the least of its advantages.

Transatlantic Radio-telephony.

The Inauguration of a Unique Service between London and New York with the Aid of British-made Apparatus is an Epoch-making Event.

A TRANSATLANTIC radio-telephone service between London (England) and New York (America) was formally inaugurated on January 7th, an achievement which reflects the greatest credit on all concerned, but it is perhaps not generally realised that the high-power transmitter used at the Rugby station (England) is almost entirely a British product.

By far the greater part of the work, *e.g.*, the power amplifier, the control table, &c., was carried out in London at the works of Standard Telephones and Cables, Ltd., in co-operation with the Engineering Department of the British Post Office. The power amplifiers used are capable of giving an amplication of the order of 500,000,000 times, with very great purity, by means of a relatively small number of water-cooled valves. Thirty-four valves are used, fig. 1, and thirty of them working in parallel constitute the final stage that handles the actual output of the transmitter. One thousand gallons of water per hour is required for cooling the valves in each of the two units into which the amplifier is divided; the water flows through 160 ft. of 2-in. hose so as to maintain the insulation of the valves, which are designed to operate with 10,000 volts on their plates, and these were also manufactured for the British Post Office at the New Southgate works of Standard Telephones and Cables, Ltd.

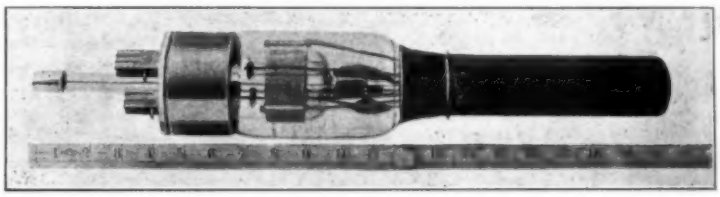


Fig. 1.—A 10-kW Water-Cooled Valve used at Rugby.

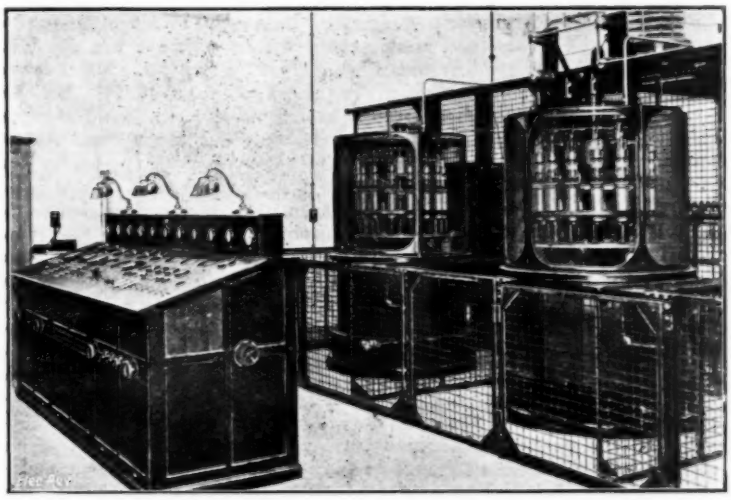


Fig. 2.—The Control Desk and Amplifier at Rugby.

Another extremely interesting part of the equipment is the control table, fig. 2, which is so placed in the station that from it the whole of the more important equipment can readily be seen. It carries all the controls for operating the equipment, and they are so grouped that the operator can follow and check the performance of the transmitter at each stage; for this purpose no less than 33 recording instruments are provided. The control table also carries devices for safeguarding the operating personnel, and others for protecting the valves, which are very costly owing to their intricate design and difficult manufacture. In the event of anything abnormal occurring in the apparatus, or of a person approaching dangerously near the high-voltage plant, the station is instantly shut down and an alarm given; the exact nature of the fault in such cases is indicated by lamps which light up on the control table.

Although the Rugby station is at present working satisfactorily, development work is still being carried on, and several ways of effecting immediate improvement are apparent to the Post Office engineers, who are negotiating with Standard Telephones and Cables, Ltd., for the manufacture of the necessary additional apparatus.

Messages are accepted in the usual way at the London Trunk Exchange, whence they go by land line to Rugby, then by wireless across the Atlantic Ocean to the Houlton receiving plant, and then by land line to New York; the return circuit is from New York to the Rocky Point transmitter, then to the Wroughton receiver (England) and finally to London. At the Trunk Exchange an operator controls the volume of sound emitted by the subscriber,

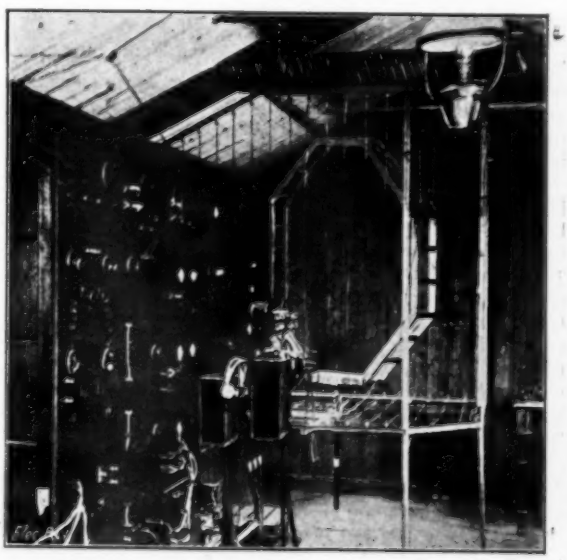


Fig. 3.—Receiving Apparatus at Wroughton, near Swindon.

so as to maintain it at the required standard. The American Telephone and Telegraph Co. co-operated in establishing the service.

The Electricity (Supply) Act, 1926.

An Explanatory Analysis of Provisions of the New Act, and a Critical Review of the Measure from the Legal Point of View.

By W. S. KENNEDY, Barrister-at-Law.

THE new Electricity Act may be considered from several points of view, and has been severely criticised from all. The political and social implications of the Act, though extremely important and, in the writer's opinion, likely to be of benefit to the country, are outside the scope of this article. With the technical aspect of any scheme which may be evolved under the Act, the writer is hardly competent to deal; his aim is to endeavour only to analyse the provisions of the Act and translate them, where necessary, into language more easily understood by the non-legal mind than the somewhat cumbrous phraseology necessarily employed by those whose object it is to provide for all possible contingencies.

The Act, as is well known, is based on the report of Lord Weir's Committee, and it is a legitimate surmise that the scheme which the Commissioners are to submit to the new Board will follow generally that which is outlined in the report. But it is important to note that the Act does not adopt the report, and indeed differs from it in important particulars; and, further, that the Act does not contain or give legal sanction to any of the technical details of that document. It is premature to criticise a scheme which has not yet been published, and must be subjected to a searching examination by impartial tribunals before it can become effective. We are here concerned only with the administrative frame and machinery which was recommended by the Weir Report, amended in the Bill as introduced, and further altered in Parliament to become the present Act.

The end to which this machinery is established is the development and cheapening of the supply of electrical energy in the country by co-ordination of generation, interconnection of supply systems, and, to such degree as is necessary, standardisation of frequency. With this end and, generally speaking, with the means suggested for its achievement, no one is likely to quarrel. It is, in effect, a development and wider application of the general principles put before the Commissioners during the London Inquiry in 1921. A scheme on those lines proved to be impossible because certain of the supply authorities were unwilling to allow the control of their generating stations to pass in any degree out of their own hands, and the Commissioners had no powers of compulsion. It will be remembered that such powers were given in the original Bill of 1919, but struck out in its passage through Parliament. They are restored in another form in the present Act, and are, in the writer's opinion, a regrettable necessity. If agreement could have been reached between the divergent interests represented before the Commissioners in the various inquiries they have held, compulsory powers would probably have been unnecessary. As it is, it may be hoped that their existence will make their use improbable.

The Act consists of 52 sections and seven schedules. It is divided into seven parts, dealing with the following matters: Sections 1-3, Constitution and general powers of the Board; Sections 4-19, Provisions as to scheme; Sections 20-25, Subsidiary provisions as to Board; Sections 26-30, Financial provisions; Sections 31-35, Miscellaneous; Sections 36-50, Amendments of earlier Acts; and Section 51, Interpretation. It is convenient to deal with these groups separately, although a certain amount of overlapping is inevitable.

1. The Board.

The first thing perhaps to note is that the Board, which has very large powers, is not a Government Department. In some ways the Commissioners, who are part of the Ministry of Transport, have been deprived of authority which has been given to the Board. This fact should at least give pause to those who, in delight or disgust, proclaim the Act to be a socialistic measure. The second important point is that the Board will not be a technical body. The Minister of Transport, before appointing the members, is to consult not only representatives of the electrical industry, but those of local government, commerce, industry (whatever this may mean—presumably any business which is not included under other heads), transport, agriculture, and labour. The minister is not bound to accept suggestions made to him by these bodies, but the Government's intention is obviously that the Board should not be composed of electrical experts. It will be comparable rather to the Board which has charge of broadcasting, if the comparison be not derogatory, than to the Commissioners. The Chairman and some other members are to devote their whole time to the work, but apparently the majority of the Board will act as directors and simply attend regular meetings. From the fact that three, out of the eight, constitutes a quorum, we may if so inclined deduce that possibly half the Board will be whole-time members. They are to be paid such salaries as the Minister may determine, and the enormous figures suggested in some daily papers exist only in the sub-editorial imagination. No member of the House of Commons may be a member of the Board—a very wise provision—and presumably the Board will be answerable for its proceedings to the whole House and not, except where the Act expressly provides, to the Minister of Transport. An opportunity is given to the House to discuss the Board's work when its annual report is laid before Parliament (Section. 25).

The general duty of the Board is to supply electricity to authorised undertakers, but not to generate itself, save in very exceptional cases. The Board will not become a competitor of existing undertakers. There are in Section 2 important provisions as to the Board's power of delegation. Any powers which the Board thinks may be more conveniently exercised locally may be delegated to authorised undertakers, except that the Board may not delegate its powers with regard to selected stations. This provision is of special interest to London, for it allays the fear which has been expressed that the Board might select the most efficient of the companies' stations and hand the management of them over to the J.E.A.—a course which would not be consistent with the spirit of the London and Home Counties Order. The Board must also retain in its own hands the power of fixing tariffs.

2. Provisions as to Scheme.

The scheme—or schemes—for development and reorganisation are to be prepared by the Commissioners and submitted to the Board as soon as possible. It is common knowledge that work on certain areas is already well advanced, but it is premature to criticise schemes which have not yet been published. The Weir Committee's Report gave certain figures, but these cannot

be taken as the Commissioners' final word, for much detailed investigation has been carried out since its publication. The Act itself contains no figures, but lays down the general lines which the Commissioners are to follow. The scheme is to relate to a definite area—there is no reason to suppose that the country is to be dealt with in one scheme as a whole, though general interconnection is certainly ultimately desirable. For that area the Commissioners select certain existing stations as being suitable—with possible alterations and extensions either immediate or future—for supply in the area generally. They are also to indicate what new stations should be built to provide for future developments; these are also known as selected stations. It is from these selected stations that eventually the whole supply will be given. A scheme is further to provide for the interconnection of selected stations, which is obviously necessary for economical working and for the interconnection of the system in the area with the system in any other area (presumably this means a contiguous area) where a scheme is in operation or may come into force.

(To be continued.)

Legal.

Colassi v. Smith.

IN the Mayor's and City of London Court, before Mr. Registrar Dell, on January 4th, a claim was made by Mr. W. L. Colassi, Fenchurch Street, E.C., against Mr. A. C. Smith, Fulham, for £3 7s. 6d., the value of wireless goods supplied as samples. The plaintiff said that in response to an advertisement which he inserted for a traveller to sell loud speakers, the defendant called and was given a sample, as well as batteries and valves, for the purpose of securing business. No business came, and he (plaintiff) wrote to the defendant asking for the return of the samples, but received no reply. The defendant admitted that he was in the wrong in not returning the samples, but he was willing to do so. He had carried the samples for a month without any remuneration. The plaintiff, in answer to the Registrar, said that there was no arrangement for defendant to have anything on account of expenses. The Registrar made an order for the return of the samples, and judgment was given for the plaintiff accordingly, with costs.

The Transporter Co. v. Johnson.

IN the Mayor's and City of London Court, last week, the plaintiffs, of Cannon Street, E.C.4, claimed £1 8s. 2d. from Mr. R. F. Johnson, Luton, for freight and charges. It was stated that a consignment of batteries was sent from Berlin to the defendant. Upon delivery, the batteries were found to be damaged; the defendant accordingly sold them for what they would fetch and remitted the proceeds to the plaintiffs. Defendant corroborated this, and said that the plaintiffs should have deducted their costs from the amount sent them before passing it on to Berlin. Mr. Registrar DELL considered that the plaintiffs had not proved their claim, and struck the case out of the list.

Heren v. Babcock & Wilcox, Ltd.

BEFORE Judge Shewell Cooper, in the Mayor's and City of London Court, on January 3rd, Mr. C. C. Heren, Plaistow, sued the defendant company for £468 in respect of damages under the Employers' Liability Act, 1880. In his evidence the plaintiff said that he was an acetylene operator and was employed at the Islington power station in the dismantling of a boiler. While working there some piping fell and struck his head; he sustained a compound fracture and septic scalp wounds, and was in hospital for nearly a fortnight. Since the accident he had suffered from severe headaches, and claimed that he was permanently incapacitated from following his employment. He admitted in cross-examination that he knew there was a possibility that the piping would fall. Evidence was given that it was the usual practice in dismantling boilers to support any parts which might fall. The foreman in charge of the work said that the piping did not actually fall; it merely turned in a bracket which supported it.

Judge SHEWELL COOPER absolved the foreman from all blame, and said that the methods adopted by the defendants were perfectly satisfactory. The plaintiff also knew of the risk which attached to the position in which he was working. The claim must therefore be dismissed with costs. Considering the matter under the Workmen's Compensation Act, his Honour said that from the medical evidence he was satisfied that the plaintiff was totally incapacitated from work since the date of the accident and at present. He therefore awarded him 30s. a week, and gave instructions that £10 of the amount due should be deducted towards the payment of the defendants' costs in the action. Leave was given to the defendants to make any application that they thought desirable.

The Sale of Batteries on Closing Day.

AN interesting case recently came before the magistrates at Grimsby when a local trader was summoned under the Shops Closing Order for selling radio batteries on closing day. The defence submitted was that the renewal of exhausted batteries represented a repair of the set and consequently was a public service. The case was therefore dismissed.

Rating Appeal by Aberdeen Corporation.

IN the Valuation Appeal Court, Edinburgh, on January 7th, before Lords Hunter, Sands, and Morison, counsel were heard in an appeal by the Electricity Department of the Corporation of Aberdeen against the decision of the Valuation Committee of the city entering the value of the undertaking for the year 1926-27 at £68,185. Counsel stated that he was supported by the other Scottish municipalities with similar undertakings. The appellants objected on the ground that deduction had not been allowed in respect of sinking fund and interest on capital expenditure on buildings and plant before they were completed and became revenue-producing subjects. They claimed that sums of £6,971 and 419 should have been deducted.

The Assessor maintained that the expenditure of which deduction was claimed was an application of net revenue and not a valid charge against revenue. An annual sum properly raised by the appellants by means of charges made under their statutory powers could not be excluded from computation for purposes of the revenue principle merely because the present owners chose to spend that portion of their revenue in a particular way. In the event of the deduction being allowed, the Assessor submitted that the calculation for fixing the annual value should be three years instead of five years. The Court reserved judgment.

Sentence.

AT Bow Street Police Court, on January 7th, Willoughby L. Brooks, accountant, was found guilty of stealing money from his employers, the Tudor Accumulator Co., Ltd., and was sentenced to six months' imprisonment in the second division.

Manslaughter Charge Against a Colliery Company.

AT the Bridgend Police Court on January 10th, Messrs. Cory Bros. & Co., Ltd., and three of their electrical engineers were summoned upon a charge of manslaughter. It was alleged that the defendants had set or caused to be set a man-trap, *viz.*, an electrified fence, by which a youth named Brynmor Edward John was killed in August last. The secretary of the defendant company appeared and entered a plea of "not guilty."

Mr. ARTEMUS JONES, for the prosecution (undertaken by the brother of the deceased youth through the South Wales Miners' Federation), stated that the company was troubled by the theft of coal, and to put a stop to it a fence was erected, consisting of three copper wires supported by insulators on pit props. Between certain hours the fence was electrified, and notices were erected warning trespassers of the fact. On the day he met his death, John and some companions were chasing a rat with a dog, and got through the fence unscathed. While they were on the colliery premises a whistle was blown, and upon his return through the fence John received an electric shock and collapsed. The pressure was stated to be 110 V.

The brother of the deceased said that John was in good health at the time, and he did not know of deaths from heart failure in the family. A number of witnesses deposed that they heard the whistle, and a shopkeeper repeated a conversation which he heard between two of the engineers who were charged with the company, in which they mentioned the erection of the fence. Sir E. MARSHALL HALL, K.C., for the defence, suggested that there was no foundation for the statement, but witness maintained that it was true. Medical evidence was given that death was due to shock; the witness could not state whether or not there was a bruise on the dead youth's skull. Sir E. Marshall Hall suggested that the pressure on the fence was only 60 V and asked witness if he had known of any previous death from a shock at that pressure. The witness said that he had not.

The hearing was adjourned until January 11th, when Sir Bernard Spilsbury was called as a witness for the prosecution. He said that death was caused by heart failure due to the passage of an electric current. Death from such a low voltage was rare, but the conditions were apparently favourable. The defendants were committed for trial, bail being allowed.

Theft of Electricity.

AT the Dukinfield Police Court last week penalties amounting to £8 10s. were imposed upon Charles Burton, a motor engineer, who was found guilty of fraudulently abstracting electricity from the mains of the Stalybridge and Hyde Joint Electricity Board. It was stated that the supply had been cut off from the defendant's premises owing to the non-payment of an account. The seal of the meter had been broken and a connection made.

D

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A.-E.L.M.A. Campaign.

The official report for the week ended January 8th, states that new electric demonstration houses were opened at Denton (Manchester), Bishop Auckland, Doncaster, Bradford and West Bridgford (Nottingham). The Bradford house was organised by Mr. H. Wilson, a local electrical contractor. It has been decided to open the Denton house on Sunday afternoons. Campaign "revival" meetings have been held in several places in response to the organisers' call for increased efforts. Great activity is reported from Cardiff, where more successful houses have been run. Arrangements have been made for a large model to be displayed for a week in the window of one of the principal stores. During the week sandwichmen will distribute cheque-coupons. Works meetings are being held in the Lancashire area and other areas are urged to follow this example. The opening of the Aberdeen house has been deferred until the end of January. The first of Glasgow's three houses is to be opened next week; 100,000 descriptive leaflets have been printed for distribution, and a local advertising campaign is being launched. Exhibitions in lieu of houses are being run at Dewsbury, Dudley, Hagley, Halesowen and Wolverhampton. An exhibition is to be held

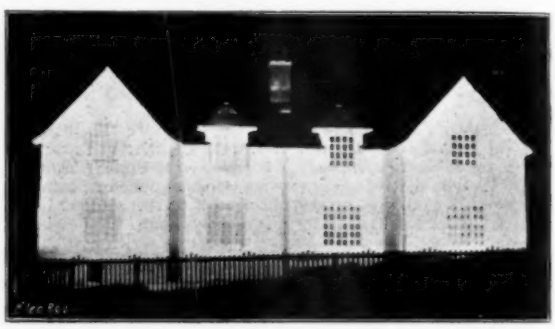
Campaign Display at the Greenock Exhibition.

at Falkirk from February 7th to 11th, and exhibits have been arranged by five manufacturers and five local contractors. Immediately after this exhibition another will be held at Dumfries.

We have already reported that the Greenock Corporation recently held an electrical exhibition. This was designed to convey an excellent idea of the many domestic uses of electricity. Two of the principal sections were a nicely-furnished sitting room and a kitchen. In the latter apartment demonstrations of electric cooking were given by a capable operator and half-hour film programmes were presented at intervals. A special display was arranged to draw attention to the campaign and this is illustrated herewith.

In our last issue we reported the opening of the demonstration house at Denton, Manchester. From the illustration of the building, which is reproduced herewith, it will be seen that the house is similar to many thousands in this country, and can be taken as a fair example of the type of dwelling to which supply authorities and contractors should pay particular attention. Such houses form the backbone of the domestic load.

The Dundee demonstration house which was open to the public from November 20th to December 18th, is depicted herewith. The Dundee circle reports that the premises were visited by about 5,300 persons and 500 competition booklets were distributed. The house was designed for educational purposes primarily and no great efforts were made to effect direct sales or to secure new consumers.



The Dundee Electric House.

With the object of reviving interest in the campaign a mass meeting of supply engineers and chairmen of local Electricity Committees was held at the Lighting Service Bureau, Manchester, on January 6th. The meeting, which was rather poorly attended, was presided over by Mr. P. P. Wheelwright, Blackburn, the chairman of the North-Western Campaign Committee, and the principal speaker was Mr. W. E. Bush (E.L.M.A.). After a few preliminary remarks, Mr. Bush said that although 106 local circles had been formed, only one of them, *viz.*, that at Liverpool, was in the North-Western area. The circles were the main inspiration of the campaign and the Central Committee had hoped that as the national adver-

The All-Electric Home at Denton, Manchester.

tising campaign was reduced in intensity, so would the circle activities increase and the matter become more and more localised. The circles in various parts of the country had done really beneficial work, but in nothing more perhaps than in bringing the various sections of the trade together. One of the most pleasing features was the determination of most of the circles not to disband at the end of the campaign but to keep together ready for future work. In booklets the

North-Western area had not done so badly; out of 800,000 issued, the area had taken 116,000, but the committee did not think the total sufficient, and it had decided that as from February 12th, the trade should be asked to circulate the booklets direct to the public. A proportion of the extra cost would be borne by the National Committee.

In a subsequent discussion Mr. H. C. Lamb, the Manchester City Electrical Engineer, said that a circle was being formed to include Manchester, Salford and Stretford and a feeling of co-operation had been established amongst all parties. Complaints were made by other speakers as to the lack of interest shown by contractors and in some particular cases by their local Associations who had been invited to discuss the matter but had done nothing further. The apathy, and to some extent suspicion, of the public was referred to, and in one case quoted, out of 14,000 circulars sent out, not more than 200 applications for booklets had been received. The advantages derived from a well-got-up campaign window display were extolled by Mr. Wheelwright.

A Flood-lighted Church.

The accompanying picture is a view of the interior of St. Cuthbert's Church, Philbeach Gardens, S.W.5, and was taken solely by the light from a new installation carried out by Mr. W. J. Adams, 205, Tolling Road, Hammersmith. Ten "Gecoray" floodlight projectors, each equipped with 200-W "White Osram" gasfilled lamps, illuminate the nave, being fixed at clerestory level about 40 ft. from the floor. The chancel, reredos, and Lady Chapel are similarly illuminated. The aisle is lighted by ten smaller units, in which 100-W lamps are employed. All the projectors point towards the chancel, and thus there is no glare in the eyes of the congregation. Each unit is separately plugged. Readings taken on a horizontal plane 2 ft. 6 in. above floor level gave the following average intensities of illumination:—Nave, 3 ft.-candles; chancel, 5.5 ft.-candles; and aisles, 2.5 ft.-candles. The General Electric Co., Ltd., prepared the scheme in collaboration with Mr. S. T. Puzey, P.A.S.I.

St. Cuthbert's Church, S.W.

Hungarian Electrical Contracts.

According to Hungarian Press reports, the Hungarian Ministry of Commerce has invited the interested branches of industry to bring forward competitive offers for the construction of a great electric power station. Two offers were received, one from the English "Talbot" group and another from a Swiss and Hungarian group. The offer of the "Talbot" group includes, besides the supply of electricity for all the needs of Budapest, the electrification of the State Railways. It is proposed to erect a great super-power station in the coal fields of Tata in agreement with the Hungarian General Coal Mining Co., Ltd. The group is represented to have come to an agreement with Ganz & Co. concerning the supply of electric locomotives.—*Reuter.*

Telephone Manufacturing in Spain.

The National Telephone Company of Spain intends to enlarge its plant so as to be able not only to supply the needs of the Spanish telephone system, but also to export telephone material to South America.—*Reuter's Trade Service* (Madrid).

New Tricity Restaurant.

On Monday last Mr. A. F. Berry presided over a luncheon attended by a large number of representatives of the newspaper and technical Press, held at the new Tricity Restaurant in the Strand, at the corner of Savoy Street. This is an all-electric restaurant of the first class, which has now taken the place of the original Tricity House restaurant which has rendered such excellent electrical propaganda and publicity service during the past fourteen years. Mr. Berry described the objects of the new restaurant, which was duly formally opened. We shall deal fully with the matter in our next issue.

A New Public Clock.

A large turret clock has recently been made and erected by MESSRS. GENT & CO., LTD., Leicester, in the water tower of Messrs. Terry & Co.'s chocolate factory at York. A peculiar feature of the installation is that a large water tank occupies the space immediately behind the dial openings, there being only a few inches between the inside wall and the tank, as it occupies the space which should, in the ordinary way, be available for the usual mechanism and the radial connecting rods for the four dials which are each 8 ft. in diameter and arranged for internal illumination. The problem, therefore, was to drive the hands of the clock from a mechanism fixed many feet below the tank and 16 ft. below the dials. The difficulty was surmounted by designing special gear which could be fixed from the front of the dials through detachable portions thereof, and by providing a mechanical connection with the waiting-train movement fixed below the tank by means of four lengths of ordinary bicycle chain. In order to illuminate the dials internally, the electric lamps have had to be lowered from the top of the tank to the desired positions behind the dials, there being no other means of access. In the same circuit as the large clock, there are a number of wall clocks distributed throughout the works, as well as a system of "start" and "cease work" sound signals. The whole is controlled from the same prime transmitter or master clock, so uniform time is shown throughout. The clock is depicted in the accompanying illustration.

A Turret Clock at York.

Russia Pays for Machinery.

The *Financial Times* says that orders received from Russia enabled some of the leading textile machinery concerns to run practically full time for a good part of last year. Our exports of this class of machinery to Russia during the first eleven months of the year aggregated 12,672 tons, as compared with 1,661 tons during the corresponding period of 1925. It is expected that further contracts will be negotiated within the next few weeks. Careful inquiries show that in every instance the Russians have honoured their financial obligations with great promptitude.

Calendars and Diaries.

We again have to acknowledge and reciprocate the season's greetings from a number of our friends, and thank them for calendars, &c., which we have received from them.

MESSRS. JAMES ARMSTRONG & CO., of Manchester, ask us to state that their supply of diaries has been exhausted, and they regret their inability to meet all requests.

From the B.E.N. PATENTS, LTD., 96-98, Victoria Street, London, S.W.1, we have received a desk pad calendar with ample space for daily memoranda.

A New Year greeting card has been sent to all its domestic consumers (about 12,000) by the ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD. This depicts in warm colours an "all-electric" sitting-room; explains a number of common electrical terms; and gives details of the various tasks which a unit of electricity will perform.

From the COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD., we have received the usual telephone wall-card. The picture extols the virtues of the electric motor.

A pocket diary ("Cromwell" series), containing an insurance coupon, useful general information, &c., has come to hand from the LONDON MAGNETO REPAIRING & WINDING CO., LTD., of 78, Hampstead Road, London, N.W.1.

MESSRS. MATHER BROS., 36, Farringdon Street, E.C.4, have retained the usual style for their calendar, *i.e.*, large monthly sheets with a date-marking device.

From MESSRS. MAWDSLEYS, LTD., of Dursley, Glos., we have received a wall calendar with unobtrusive monthly slips below a charming coloured view "In Sunny Algeria."

The SHROPSHIRE, WORCESTERSHIRE & STAFFORDSHIRE ELECTRIC POWER CO. has sent us a large wall calendar in which the business note is very inconspicuous. The subject is a lady in eighteenth-century costume, and both the subject and the treatment are admirable.

Once again the DUSSEK BITUMEN CO., LTD., of Bromley-by-Bow, has prepared a handsome pocket case and diary, with ample engagement and memoranda spaces and insurance coupon.

MESSRS. WM. SANDERS & CO., of Falcon Electrical Works, Wednesbury, have sent us a telephone scribbling pad on a metal base.

MR. S. BAXTER, 102, Greyhound Road, W.6, has sent us a businesslike wall calendar with plainly-printed monthly sheets.

Trade Announcements.

The business lately carried on under the style of Coughlan and Tyrrell, Ltd., has been purchased by TRELLEBORG EBONITE WORKS, LTD., from the liquidator, Mr. A. T. Keene, and will be carried on by them.

MESSRS. SANTON, LTD., have removed from 34, Bridge Street, to 149-150, Dock Street, Newport, Mon.

The offices of MESSRS. A. W. BEUTELL, LTD., have been removed to the company's works at Christopher Place, Chalton Street, Euston Road, N.W.1.

MESSRS. THOMAS BROADBENT & SONS, LTD., have now opened an office of their own at 65, Bath Street, Glasgow, under the management of Mr. Eden Field. (Telephone: Douglas 2459; telegrams: "Broadbent, Glasgow.")

Mr. J. SCRIVENER, who has been associated with the sale of vacuum cleaners for many years, has formed a new company, VOLTA, LTD., to sell "Volta" suction cleaners and other labour-saving devices, exclusively to the trade. Offices and showrooms have been taken at Kern House, 36-38, Kingsway, W.C.2 (telephone: Holborn 0188 and 0189), to which address all communications for Mr. Scrivener should be sent.

The Cardiff address of the MACINTOSH CABLE CO., LTD., has been changed to 98, St. Mary's Street. Telephone No.: "Cardiff 2224."

New Catalogues and Lists.

MESSRS. LANDIS & GYR, LTD., Elgee Works, Windmill Road, Hampton Hill.—An illustrated pamphlet dealing with the company's instrument transformers.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—January calendar-blotter advertising the "No. 554" electric fire, which is of an ornamental pattern.

MESSRS. L. MCMICHAEL, LTD., Wexham Road, Slough.—A pictorial blotter advertising the company's "Unimic" and "Dimic" coils.

THE CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham.—An abridged price list of "Credenda" conduits, fittings, cables and flexibles.

MESSRS. G. COHEN, SONS & CO., LTD., 600, Commercial Road, E.14.—A catalogue of power plant for disposal, including coal-handling plant, pumps, boilers, generating sets, motors, &c.

The NEW PELAPONE ENGINE CO., LTD., 41, Baker Street, W.1.—Leaflet No. 156, an illustrated pamphlet dealing with the new "Pelapone Simplex" range of country-house electric lighting sets.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—A well-illustrated brochure describing in detail the "Samson" 1927 model chain coal-cutting machine for electrical or pneumatic operation.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38 and 39, Upper Thames Street, E.C.4.—Monthly price sheet (January) containing illustrations and prices of electrical appliances, accessories and materials.

THE BRITANNIA MANUFACTURING CO., LTD., 22-26, Britannia Street, City Road, N.1.—An illustrated pamphlet dealing with electric cranes, hoists and winches; and a postcard advertising second-hand motors and dynamos.

MESSRS. DORMAN & SMITH, LTD., Ordsal Electrical Works, Salford.—Catalogue No. 100, a 230-page publication in strong binding containing illustrations and prices of fuse-gear of all kinds, battery switchboards, motor controllers, switchgear, cable-jointing equipment, industrial lighting fittings, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 802, an attractively-produced brochure upon automatic sub-stations, giving fully-illustrated particulars.

MESSRS. FREDK. J. GORDON & CO., LTD., 92, Charlotte Street, W.1.—A priced and illustrated catalogue of battery-charging equipment, including motor-generators, switchboards, lead moulds, and all kinds of tools.

HOPKINSON INDUCTION MOTORS, Willesden Lane, North Acton, W.3.—January stock list of a.c. motors, ranging in size from 0.5 to 30 h.p.

Bankruptcy Proceedings.

R. L. BROCK, electrical engineer, trading as R. L. Brock and Co., Bedford Row, Plymouth.—The public examination of this debtor took place at the Plymouth Bankruptcy Court on January 4th. The statement of affairs showed liabilities estimated at £1,723, and assets of £355, leaving a deficiency of £1,368. Debtor stated that he started business in 1919 with £120, which he received as an Army gratuity. This venture cost him about £300. When the "boom" in the wireless trade came he took a wireless expert into partnership. In 1925 the partnership was dissolved, and matters went so unfavourably that he had to sell his premises, and the bulk of the proceeds went to the first mortgagee. His failure was contributed to by the fact that much of the work undertaken by the firm had been under-estimated, and that, owing to incompetent workmen, some of it had to be done over again. The Official Receiver questioned him regarding an apprentice, from whom he obtained a £50 premium for a three-year indenture shortly before his bankruptcy. Debtor said that he acted in good faith; he had suffered from lack of capital ever since he had been in business. The examination was adjourned until February 18th.

A. A. WATMOUGH, carrying on business in co-partnership with W. Hurworth (Hurworth, Watmough & Co.) as electrical engineers, 41, Town Street, Horsforth, and 1, Back James Street, Harrogate.—Supplemental dividend of 2s. 1½d. in the £, payable January 20th, at the Official Receiver's office, 24, Lower Bond Street, Leeds.

G. TURNER (Radio Supply Co.), electrician and wireless dealer), 34, Mesnes Street, Wigan.—Last day for proofs for dividend January 22nd. Trustee, Mr. E. D. Symond, Official Receiver, 11, Dale Street, Liverpool.

Company Liquidations.

KENYON & TORRANCE, LTD., electrical and automobile engineers, Manchester.—A meeting of creditors was held last week, at the offices of Messrs. Whittaker & Provis, C.A., Mount Street, Manchester, when it was reported that the liabilities were £336 and the net assets £103, leaving a deficiency of £233. The issued capital of the company was £202, making a total deficiency of £435. In addition to the liabilities shown in the statement there were cash claims for £1,128, representing money advanced to the directors and their friends, but those claims were being withdrawn. The business had been closed down. The company was formed in February, 1924, and since its inception there had been a gross profit of £1,589, but after allowing for all the expenses there had been a net loss. A resolution was passed confirming the voluntary liquidation of the company with Mr. G. Whittaker as liquidator.

MINING REQUIREMENTS CO., LTD., Wombwell, near Barnsley.—A meeting of creditors was held recently, at the Law Society's Rooms, Sheffield, when a statement of affairs was presented which showed ranking liabilities of £1,313, all of which were due to the trade. The net assets were £819, leaving a deficiency of £494. It appeared that there was uncalled capital to the extent of 10s. a share on 1,200 shares. A resolution was passed confirming the voluntary liquidation of the company, with Mr. T. C. Parkin, 36, Bank Street, Sheffield, as liquidator, whilst a committee was also appointed consisting of the representatives of the British Thomson-Houston Co., Ltd., Callender's Cable and Construction Co., Ltd., and the Hallamshire Electric Co., Ltd. The following are creditors:—

	£		£
Angus, Geo., & Co., Ltd.	57	Henley's (W. T.) Telegraph Works Co., Ltd.	23
British Thomson-Houston Co., Ltd.	200	Metro-Vick Supplies, Ltd.	94
Callender's Cable and Construction Co., Ltd.	59	Middlesbrough Steel Tube and Conduit Co., Ltd.	20
Earle, G. & T. (1925), Ltd.	40	Peck, J. H., & Co., Ltd.	155
Edison Swan Electric Co., Ltd.	66	Premier Accumulator Co., Ltd.	55
Electrical Components, Ltd.	69	Saxonia Electrical Wire Co., Ltd.	55
Electrical Conduits, Ltd.	35	Walsall Hardware Manufacturing Co., Ltd. ...	48
General Electric Co., Ltd.	47	Warren Bros	26
Hallamshire Electric Co., Ltd.	103	Webber, J. M., & Co., Ltd.	55

KNIVETOWN ELECTRIC WIRE CO., LTD.—Winding up voluntarily. Liquidator, Mr. S. W. Tubbs, 24, Basinghall Street, E.C.—A meeting of creditors was held at the Institute of Chartered Accountants, Moorgate Place, E.C., on January 10th.

Capital Issues in 1926.

Statistics compiled by the Midland Bank show that new issues of capital totalling £253,266,414 were made during last year as compared with £219,986,630 in 1925. Of this, electric light and power issues accounted for £11,523,092, as against £7,242,534; telegraph and telephone issues for £1,220,890, against £2,136,000; and tramway and omnibus issues for £2,355,152, as compared with £409,916 in 1925.

Social Events.

For their annual pantomime which they give to audiences largely composed of poor children of the city, the children of employés of the Birmingham Electric Supply Department this year chose "Dick Whittington," the chief performance of which was given on January 3rd, at the Temperance Hall, Birmingham. The Lord Mayor of Birmingham, Alderman A. H. James, and Mr. R. A. Chattock, the city electrical engineer, were present, and both warmly commended Mr. Joseph H. Fletcher, who directed the performance, and those who assisted him. Excellent electrical effects were provided by the Department's engineers.

On New Year's Day the football team of the Walsall Hardware Manufacturing Co., Ltd., had the pleasure of beating the M.E.M. team by two goals to *nil* after a hardly fought game. After the match, the rival teams, with representatives of the management of the two companies, dined together. A return match is to be played.

The A.T.M. Orchestral Society, numbering 35 performers, in conjunction with the Barnabas Singers, a talented vocal quartette party, gave a concert at Picton Hall, Liverpool, on December 23rd in aid of the local Goodfellow Fund. In the course of the evening Mr. G. W. Moore, general manager of the Automatic Telephone Manufacturing Co., Ltd., formally presented a conductor's baton to Mr. C. Brandreth as a mark of appreciation of his efforts in raising the orchestra to such a commendable pitch of efficiency.

On January 1st, the G.E.C. Sports Club put four football elevens into the field, two matches being won and two lost. The first eleven played Parkside and won by 9 to 2; the second played Selfridge's and won by 5 to 1; the third played British Petroleum and lost by 0 to 6; and the fourth played Clesco and lost by 1 to 6. Preston, of the first eleven, scored seven goals against Parkside.

On January 5th the Electric Art Shades, of Kelvedon, Essex, gave their annual dance at the Parish Hall to their employés numbering nearly 200. Mr. H. A. Chard, the sales manager, acted as M.C.

Last week the Dewsbury Corporation tramways football and billiards teams, and their supporters, entertained the corresponding teams and supporters of the Halifax Corporation tramways. In the afternoon a football match in the Yorkshire Tramways League competition was won by Dewsbury by four goals to three. After tea there was a billiards match, Dewsbury again winning. The remainder of the evening was devoted to a social and concert.

On January 7th, Mr. and Mrs. R. E. Robson entertained the employés of Messrs. Robson & Coleman, Newcastle, and their friends, at their annual whist drive, supper and dance. About 120 people took part and spent a very enjoyable evening. Music for dancing was provided by Mr. J. B. Anderson's orchestra. At the close of the evening, Mr. Robson presented Mrs. Meikle, caretaker of the firm's premises, with an armchair and a gift of money, in appreciation of her 50 years' service.

The Edinburgh Electrical Society held its annual whist drive and dance in the Albyn Rooms last week, when a representative gathering of the electrical trade of Edinburgh was present. Whist prizes were given by the leading electrical manufacturers and suppliers. Special lighting effects were arranged, and a thoroughly enjoyable evening was spent.

Book Notices.

MESSRS. BRUNTONS, Musselburgh, have issued a small book, intended for the use of the shop foreman, defining the various uses of wire rope slings for the hoisting of heavy machines and structures. Special consideration is given to the application of slings with reference to the inclination of the sling and the safe load limits.

"Stresses in Space Frames," by Wilfred W. Padfield. Pp. 35; illustrated. Issued by the Association of Engineering and Shipbuilding Draughtsmen. Price 2s.—This book treats on the work of simplifying the methods of finding the stresses in three-dimensional constructions.

"High Vacua," by G. W. C. Kaye. Pp. xi+175; figs. 91. London: Longmans, Green & Co., Ltd. Price 10s. 6d. net.

Miscellaneous Publications of the U.S.A. Bureau of Standards. No. 75, June, 1926, "Annual Report of the Director of the Bureau of Standards" for the year ended June 30th, 1926. Price 5 cents.

"Edison: The Man and His Work," by G. S. Bryan. Pp. xi+350; illustrated. London: A. A. Knopf. Price 18s.

Scientific Papers of the U.S.A. Bureau of Standards. No. 536, Vol. 21, "A Portable Radio Direction Finder" for from 90 to 7,700 kilocycles. Price 10 cents.

Unemployment.

There was an increase of 41,260 in the unemployment total during the week ended December 24th. At that date the total was 1,351,000, as compared with 1,309,740 on December 20th.

Free Gifts with Vacuum Cleaners.

During January MESSRS. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, W.C.2, are carrying on an intensive campaign for the sale of "Universal" vacuum cleaners. As an inducement they are giving *gratis* an electric iron, a curling iron, a toaster or a table stove to every purchaser of a vacuum cleaner. Some attractive publicity matter, illustrating both the principal appliance and the free gifts, is being sent to retailers by Messrs. Hawkins. Free home demonstrations and "easy terms" are offered.

Recent Contracts.

Besides the Birmingham contract mentioned below, INTERNATIONAL COMBUSTION, LTD., has recently secured other important work. The company is the main contractor for the 12,000-kW hydro-electric station which is to be erected at Perak, Malaya. The Anglo-Persian Oil Co. has awarded the company a contract for the extension of the boiler-house at the Abadan Refineries, Persia, and a large steel works in the North of England has ordered "Raymond" pulverising and transporting equipment from the company for the firing of a continuous billet-reheating furnace.

As reported in our "Contracts Closed" section to-day, the Liverpool Corporation has awarded a contract for a 25,000-kW turbo-generator set to the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. This is for the new Lister Drive No. 3 power station, and will be the second unit of the same size supplied for this station by the Metropolitan-Vickers Co. The station is designed to accommodate five such sets. The contract includes the supply of the necessary condensing plant and auxiliary apparatus. The new set is expected to be ready for service by the latter part of the year.

The PULSOMETER ENGINEERING CO., LTD., has received an important order for pumping plant to be installed at one of the pumping stations of the London & North-Eastern Railway at Hull. It covers four double-unit turbine centrifugal pumps, two rated at 800 g.p.m. and two at 600 g.p.m., against a head of 1,960 ft.; and two return water pumps to deliver 3,000 g.p.m. against a head of 44 ft. All these pumps are to be electrically driven, and the plant will be operated by air-break automatic control gear.

The Birmingham Power Station Contract.

We reported in our last issue that the Birmingham Electric Supply Committee had awarded a contract valued at £1,450,000 to INTERNATIONAL COMBUSTION, LTD., for the erection of a new power station at Hams Hall. The company sends us the following additional information. The station is one of the new capital power stations under the Government's electricity scheme. The civil engineering work covers the preparation of site, levelling, piling, mass concrete foundations, steel framed buildings for switch house, turbine house and boiler house; it also covers workmen's dwellings, reservoirs, railway sidings, locomotive sheds and levelling of the coal storage site, and this, together with the cooling towers and coal and ash handling plants, has been sub-contracted to the Mitchell Conveyor and Transporter Co., Ltd. The two turbo-alternators, each of 30,000-kW capacity, the two house generators of 1,500-kW capacity, also all switchgear, transformers and motor generators, as well as the condensing equipment, will be supplied by the GENERAL ELECTRIC CO., LTD., to whom the whole of this section has been sub-contracted The General Electric Co. has already supplied five large generating sets to the Corporation. In the boiler house, five of the largest water-tube boilers yet constructed in this country are to be installed, each having an evaporative capacity of 200,000 lb. per hour. The working pressure of the boilers will be 375 lb. per sq. in., and they will be operated with "Lopulco" pulverised fuel firing equipment. The water-cooled furnaces will form an important feature of the steam generating equipment, and air heating by means of the "Usco" plate type air preheater will be used throughout. The ultimate capacity of Hams Hall will be 210,000 kW. The whole of the specifications were prepared by Mr. R. A. Chattock, city electrical engineer.

Liverpool to Join the B.E.A.I.R.A.

Subject to the consent of the Electricity Commissioners, the Liverpool Corporation has accepted associate membership of the British Electrical and Allied Industries Research Association, at a subscription of £100 per annum.

For Sale.

Messrs. Edwards, Son & Bigwood will sell by auction on February 2nd, by direction of the Electric and Ordnance Accessories Co., Ltd., the freehold manufacturing premises, "Blic Works," Cheston Road, Aston, Birmingham. (See our advertisement pages to-day.)

Proposed Electricity Showrooms at Leeds.

On January 5th a recommendation by the Leeds Electricity Committee for the establishment of showrooms came before the City Council. The proposal was opposed by the Conservative members on the ground that it was undesirable that the Council should compete with its ratepayers. Liberal and Labour members supported the recommendation and it was carried by 38 votes to 26.

Indian Electrical Imports.

An official return just to hand shows that the imports of electrical equipment into India during October last attained a value of 3,700,000 rupees, as compared with 1,853,000 rupees in the corresponding month of 1925.

German Rubber-Selling Combine.

The Fulda Rubber Works Co., of Fulda, and the Deka Pneumatic Co., of Berlin, a subsidiary of the German Cable Works Co., have combined their sales organisations.—*Financial Times.*

Commercial Secretary at Hungary.

The *Board of Trade Journal* announces that Mr. H. N. Sturrock, formerly Commercial Secretary at Berlin, has been appointed Commercial Secretary at Budapest, in succession to Mr. F. H. Duke, C.B.E., who resigned recently. Mr. Sturrock will assume his duties on or about February 1st.

London Electricity Supply Changes.

Mr. F. J. Walker, general manager and secretary of the Central Electric Supply Co., Ltd., has issued a notice to the effect that, in accordance with the agreement scheduled to the London Electricity (No. 2) Act, 1925, the generating station of the company at Grove Road, has been transferred to the London Power Co., Ltd., of 6, Eccleston Place, London, S.W. The Central Company will discharge liabilities for goods supplied to December 31st, 1926, on contracts placed by them.

Chinese Notes.

A concession to install and operate electric lighting and tramways in Harbin was granted to a Chinese syndicate in 1919. This syndicate formed the Harbin Electric Light and Tramways Co. with an authorised capital of $10,000,000. Later the Government acquired an interest in the company. The concession called for a 10,000-kW generating plant and 22 miles of tramways. The first part of the programme, consisting of the erection of the power station and the laying of 8½ miles of tramways, is now in hand, a contract for $2,520,000 having been awarded to the Siemens China Co. Consignments of machinery have already arrived in Harbin. The company has applied for an extension of the term of the concession, and also for the extension of its working scope, 22 miles of tramways being considered too short for successful working. A prospectus recently issued by the company states that an annual profit of $2,700,000 gold roubles is anticipated.

Electric irrigation is being employed in parts of China. The Foochow Electricity Supply Co. recently installed special electrically-driven pumps for the purpose capable of delivering 525,000 gal. of water per hour. The pumps can be used either for pumping water to the fields or extracting it from them. The benefit derived by the owners of upland fields using electric irrigation apparatus in the Changchow (Kiangsu) district during a recent drought has led to large sales of such apparatus. The Cheng Kwa Electric Power Co. has been unable to meet the demand fully.

Hungary's Foreign Electrical Trade.

During the first six months of 1926 Hungary imported electrical equipment valued at approximately £174,000, and exported similar goods to the value of £313,000. The corresponding figures for the first half of the previous year were £93,000 and £232,000.

Electrical Employés Help Hospitals.

The employés of MESSRS. A. REYROLLE & CO., LTD., of Hebburn-on-Tyne, contributed through their Hospitals and Charities Committee during the year 1926 the sum of £969. Out of this total, £275 went to the Newcastle R.V. Infirmary, £275 to the Hebburn Infirmary, £75 to the Newcastle Eye Infirmary, £85 to the Employés' Benevolent Association, and smaller amounts to a large number of other deserving institutions and funds.

Increased Australian Copper Consumption.

The Australian Tariff Board recently considered an application for a bounty in connection with copper mining. The manager of an Australian electrolytic copper refining and smelting company gave evidence in support of the claim, and said that the proportion of his company's production consumed in Australia had increased to a remarkable extent in the past few years. In 1914, when the production was 16,401 tons, the proportion sold in Australia was 5.27 per cent. Last year the company produced 11,090 tons, and no less than 86.42 per cent. of this was taken by Australian industries. It was claimed that the production of copper in the Commonwealth had saved Australian firms very large sums of money, and should be encouraged. For some time past the cost of the production of copper in Australia generally had been higher than that of the finished product owing to the fall in the price brought about by increased world production. The Board later heard an application from Australian manufacturers for the imposition of increased import duties upon copper products and alloys of copper. This was opposed by the Australian representative of Elliott's Metal Co., Ltd., Birmingham, on behalf of the Australian Association of British Manufacturers.

Jackson Cooker Contracts.

It is interesting to record that figures recently received by the Jackson Electric Stove Co., Ltd., show that in eight towns alone there is an aggregate of 8,000 of its electric cookers installed on hire. The company has received orders from the Manchester Corporation Electricity Department for 680 cookers since the commencement of the yearly contract last September, and there are now 2,300 Jackson cookers on hire on the Manchester mains. The company has also received a contract for the supply of cookers, during one year, to the Dublin Corporation Electricity Department.

Proposed Buenos Aires Subways.

Major O. Sumner, O.B.E., has sent us a letter upon this matter, in which he states that the scheme for the construction of subways in Buenos Aires, with which he is associated, has not been rejected, as had been reported. The project is said to have strong Argentine support and to be suspended on account of one or two articles of the concession being *ultra vires* the Municipality. Major Sumner emphasises that it is the intention of his group, if the concession is granted, to place orders for equipment in England.

The Brazilian Radio Market.

Owing to adverse economic conditions, radio equipment is not selling well in Brazil at present. Importers are not only curtailing orders, but in some instances countermanding them. Complaint is made of the large amount of obsolete material still being offered at so heavy a discount as seriously to interfere with the importation of up-to-date apparatus.—*Reuter's Trade Service* (Rio de Janeiro).

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections can be entered against any of the proposed marks within one month from the dates mentioned:—

December 29th, 1926.—Roc. No. 472,446. Class 8. Instruments and apparatus and parts and accessories thereof for use in connection with radio-telephonic and telegraphic receiving and transmitting sets. Jurassia, Société Fabrique de Machines Parlantes, Ste. Croix, Switzerland. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

January 5th, 1927.—Central (lettering and design). No. 472,481. Class 6. Hand-propelled electric vacuum cleaning machines for domestic use. C.C.A. (Central Cables & Accessories), Ltd., 83, Queen Street, E.C.4.

Sterling. No. 473,157. Class 8. Telephones and radio-telephone and signalling apparatus. Sterling Telephone and Electric Co., Ltd., Marconi House, Strand, W.C.2.

Ansil. No. 473,827. Class 8. Radio-telephonic and telegraphic instruments and apparatus. N. Garnett, 482, Bury New Road, Kersal Bar, Manchester.

Colvern. No. 475,344. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy. Collinson's Precision Screw Co., Ltd., Macdonald Road, Walthamstow, E.17.

Premier. No. 468,285. Class 18. Electric welding plant. Premier Electric Welding Co., Ltd., Harrow Manorway, Abbey Wood, S.E.2.

Lamp Manufacture in Belgium.

The Société Belge de la Lampe Philips recently acquired works at Lemnis, Belgium, where electric lamps are now being manufactured for the Belgian market.

Tradesmen Using the Royal Arms.

The *London Gazette* for January 4th contains lists of tradesmen in London and elsewhere who hold appointments to Royalty with authority to use the Royal Arms.

Electrical Development in Singapore.

United States trade officials at Singapore report remarkable electrical progress during the past five years. The municipal power plant has been steadily extended, and the public demand has kept pace with the development. One of the largest stations in the Far East is to be erected by the Municipality, and this will provide a cheaper supply, which, in turn, will create a large demand for consuming devices. Since the introduction of electricity has been comparatively slow the market has not actively developed. It is considered that a progressive sales campaign for the marketing of electrical goods would produce excellent results.

Chinese Electrical Machinery Imports.

According to *Commerce Reports* the imports of electric power station machinery into Shanghai during the first half of last year were valued at 97,501 Haikwan taels, as compared with 178,220 taels in the first six months of 1925. The corresponding figures for imports into Dairen were 176,032 taels and 179,472 taels respectively.

European Copper Sales Agreement.

In order to deal with the situation resulting from the international agreements in the copper markets, a group comprising the Anaconda Copper Mines, the Société Minière Calumet, the Hecla and the United Verde Companies on the one hand, and the Union Minière du Haut Katanga and the Société Générale Métallurgique de Hoboken, on the other, have decided that their sales in Europe shall be entrusted to the same firms.—*Reuter* (Brussels).

Proposed Scottish Textile Machinery Exhibition.

The manager of the Textile and Industrial Exhibitions, Ltd., Manchester, has applied for the use of a portion of Kelvin Hall, Glasgow, for about three weeks in November next for the purpose of holding an exhibition of textile machinery, &c.; the application has been remitted to a committee.

United States Electrical Exports.

The official statistics of exports from the United States during October last give a total for the electrical section of $8,035,710, as compared with $7,512,642 in October, 1925, an increase of $523,068. The battery class showed the greatest increase—83 per cent. in the case of primary batteries and 36 per cent. in storage batteries. In general the lighter classes showed important gains, while the heavier apparatus registered losses. The export value of a.c. generators fell from $193,961 to $17,004, and d.c. generators also showed a substantial decline. Self-contained lighting outfits rose from 331, valued at $93,996 in October, 1925, to 538 ($153,414) in October last. Other large advances were made by electric lamps, telegraph and telephone apparatus, railway motors, and electric locomotives. Radio apparatus showed a fall from $1,317,846 to $1,108,442, but October, 1925, was a record month in this direction.

British Participation in International Steel Trust.

The Berlin correspondent of *The Times* says:—"According to information received here, the representative body of the British steel industry has announced its readiness in principle to join the International Steel Trust. It is stated that British representatives are to be invited to attend the meeting of the trust, which has been provisionally fixed for the first week in February. The *Börsen Courier* states that for some time the principal difficulty has not been one of willingness on the part of the British steel industry to join the trust, but arises out of a difference of opinion as to what should be the British quota. The total originally demanded by the British industry lay between ten and twelve million tons, while the amount the trust would be prepared to concede is less than nine million tons."

Salford and a Dutch Cable Tender.

In our "Contracts Closed" section last week we mentioned that the Salford Electricity Committee had recommended the acceptance of a Dutch tender for cable. At its last week's meeting the City Council adopted the recommendation by 28 votes to 7. During a discussion of the matter it was stated that the tender was 36 per cent. below the lowest British offer. Members who opposed the acceptance of the tender said that British manufacturers had to bear higher national and local burdens, which increased their costs. The chairman of the Electricity Committee quoted information prepared by the International Labour Bureau showing that Dutch manufacturers paid high wages and sustained heavy social burdens. Another councillor said that by means of rings the British cable-making companies were stifling competition and paying "enormous" dividends.

American Capital for Brazil.

The Rio correspondent of *The Times* states that American industrial enterprise is making considerable investments of capital in Brazil. The General Electric Company has announced a $28,000,000 investment project relating to Brazilian public utilities, and states that it has already purchased for 94,000 contos (£2,350,000) the Companhia Brasileira de Energia Elettrica, in the State of Rio, and other concerns in the Guinle interests. The General Electric Company's activities are stated to be due to a desire to control these and other enterprises for the purpose of selling material manufactured by the parent company, but opinion in Brazil does not doubt that its pretensions are more ambitious. The zones of the service companies purchased are only of secondary importance, and sweeping reforms and Government concessions will probably be necessary before the venture can be profitable.

Unemployment in Germany.

The official figures of unemployment in Germany show that at December 15th there were 1,464,000 people in receipt of relief, as compared with 1,369,000 on December 1st.

Threatened Strike Averted at Poplar.

Last week the members of the Electrical Trades Union employed in the erection of the new municipal generating station at Poplar threatened to cease work, alleging that the contractors were not observing the agreed conditions. It was announced later that the contractors had agreed to the men's demands, thus averting a cessation of work.

Timber Trade Report.

Our timber trade correspondent reports that the softwood market is steady with a firm tendency. Stocks in London docks are of slightly smaller volume than those of a year ago, which were large, but with the general improvement in trade which is anticipated, the demand is expected to show considerable expansion between now and May next, when navigation is resumed at North European ports. Sales to date for next season's delivery constitute a record for European wood exporters, and show clearly the confidence amongst operators in the British Isles and on the Continent that considerable progress will be made in industry this year, which will cause large quantities of timber to be taken into consumption. In the British Isles especially there is expected to be a good demand for house-building work. All the hardwoods, especially mahogany and teak, are strong in value, with stocks in first hands light, and little expected to come forward during the next few months. American woods are in good supply, but shippers' quotations have risen, restricting early future transactions with this country. This in itself tends to keep the spot market for American lumber firm whilst stocks are ample. The revival expected early in the furniture and cabinet trades, however, will do much to bring stocks to a lower level, which will be all to the benefit of the spot selling market.

Proposed Increase of Railway Rates.

The report of the Railway Rates Tribunal was issued last week. So far as goods traffic is concerned, the result of the Tribunal's decisions will be a slight increase in charges in most cases. Apart from this, the railway companies have decided to institute an increase of about 6¼ per cent. in goods traffic charges at an early date on account of their grave financial position. This increase follows upon reductions made voluntarily by the companies in the hope of increasing traffic, a policy which was justified by an increase, but one that was unremunerative.

Peruvian Duty Increased.

As from January 1st the basic import duty on electric lighting fixtures imported into Peru has been increased by one-half.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, &c.	Price Jan. 11th.	Fortnight's inc. or dec.
a Acid, Oxalic ... ... per lb.	5¾d.	...
a Ammoniac, Sal ... ... per ton.	£90	...
a Ammonia, Muriate (large crystal) ,,	£32	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£26 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4¼d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£13 10s.	...
a Sulphur, Commercial ... ... ,,	£9 10s.	...
a ,, Roll ... ... ,,	£9 10s.	...
a Soda, Chlorate ... ... per lb.	3¼d. to 3½d.	...
a ,, Crystals ... ... per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots... ... ... per ton.	£107 to £112	...
b ,, Wire ... ... per lb.	1/6 to 2/-	...
b ,, Sheet ... ... ,,	1/8 to 2/9	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net.	£262	£1 dec.
Grade II ... ... ,, ,,	£184	£2 dec.
Grade III... ... ... ,, ,,	£98	£1 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	9¼d.	...
c ,, Tubes (solid drawn) ... ,,	1/0 to 1/0½d.	...
c ,, Wire, basis ... ... ,,	10½d.	...
c Copper Tubes (solid drawn) ... ,,	1/1	...
c ,, Bars (best selected) ... per ton.	£92	...
c ,, Sheet ... ... ,,	£92	...
c ,, Rod ... ... ,,	£92	...
d ,, (Electrolytic) Bars ... ,,	£93 10s.	45s. dec.
d ,, ,, Sheets ... ,,	£104 10s.	...
g ,, ,, Wire Rods ... ,,	£74 15s.	...
d ,, ,, H.C. Wire per lb.	9½d.	½d. dec.
f Ebonite Rod ... ... ,,	2/3 to 2/6	...
f ,, Sheet ... ... ,,	2/3 to 2/6	...
a German Silver Wire ... ... ,,	2/2	...
h Gutta-percha, fine ... ... ,,	8/-	...
h India-rubber, Para fine ... ... ,,	1/4½	½d. to ¾d. dec.
i Iron Pig (Cleveland No. 3) ... per ton.	122/6	...
i ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English pig ... ... ,,	£27	20s. dec.
g Mercury ... ... per bot.	£17 to £17 17s. 6d.	...
a Mica (in original cases) small ... per lb.	3d. to 2/-	...
a ,, ,, medium ... ,,	4/- to 8/-	...
a ,, ,, large ... ,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/2½	...
p ,, ,, wire... ... ... ,,	1/3½	¼d. dec.
e Platinum ... ... per oz.	£28	...
d Silicium Bronze Wire ... ... per lb.	10½d.	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
a Tin, Block (English) ... ... per ton.	£207 to £207 10s.	10s. to 2's. inc.
a ,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on the lead position on January 8th, Messrs. James Forster & Co. stated:—"At the moment there seems nothing for it but still lower prices, but it must be borne in mind that lead at £27 per ton is no encouragement, but rather a deterrent to production. The trade prospect, particularly in the electrical industry, is much brighter than it has been for several months past, and the lower price for lead will undoubtedly stimulate consumption of the metal. We look for temporarily lower prices followed by a sharp recovery which, assisted by better trade, will probably be maintained throughout the year."

New French Company.

La Caisse Bearnaise Auxiliare d'Electrification is the name of a new undertaking which has lately been formed at Pau with a capital of six million francs to finance syndicates organised for the distribution of electricity in the Lower Pyrenees.

A French Lighting Service Bureau.

The French Society for the Improvement of Lighting has opened a demonstration salon at 134, Boulevard Haussmann, Paris, where the public are being invited to inspect the latest developments in electric lighting equipment.

German Capital Issues in 1926.

As in the previous year, little activity took place in 1926 in the direction of new capital issues in the electrical and gas industries in Germany, which are grouped together for this purpose. The number of applications for increases of capital was 20 in each year, but the amount offered for subscription rose from £1,295,000 in 1925 to £2,064,000 last year. The number of new joint stock companies formed declined from 10 in 1925 to four last year, but the capital offered increased from £159,000 to £465,000.

Selling Appliances at Manchester.

At last week's meeting of the Manchester City Council, the Electricity Committee submitted a report by the chief engineer and manager (Mr. H. C. Lamb) upon the question of the sale of apparatus from the St. Ann Street showrooms. Mr. Lamb said that it would only be possible in the existing premises to carry this out on a small scale. A stock of the more-frequently required appliances could be maintained and others could be ordered direct from the manufacturers. He suggested that a hire-purchase scheme should be adopted for radiators and wash boilers. The following articles could be sold:—Cooking apparatus, water heaters, radiators, irons, kettles, wash boilers, suction cleaners, fans, and other small motor-driven domestic appliances. It was estimated that within a year or two a revenue of £10,000 a year would be derived from this business.

A member of the Council moved an amendment deleting the matter from the Committee's minutes as it "opened the door to extreme Socialism." The amendment was rejected and the report agreed to.

Lighting and Power Notes.

Aire and Calder District.—THE ELECTRICITY ACT.—At Bradford Town Hall, on January 5th, a private meeting was held of representatives of the Conference of Local Authorities in connection with the West Riding (Aire and Calder) Electricity District. Alderman Wilfred Turner, chairman of the Bradford Corporation Electricity Committee, presided. Discussion was on the situation created by the passing of the Electricity (Supply) Act, 1926, and the meeting decided that the conference should remain in existence. A special committee was appointed to consider what steps should be taken to afford assistance to the authorities concerned in carrying the provisions of the new Act into effect.

Barrhead (Renfrewshire).—STREET LIGHTING.—A committee of the Town Council is to consider the question of lighting the streets by electricity instead of gas.

Barrow.—LOAN.—The borough electrical engineer has submitted a report to the Corporation on sub-station extensions, and has recommended that application be made for sanction to a loan of £14,560 with a view to providing for the increased load at North and South Vickerstown, and for future extensions at the Abbey and locomotive works sub-stations. The Council has approved the recommendation.

Bath.—LOAN.—The Town Council has applied for sanction to a loan of £15,178 for mains and services.

Beckenham.—ELECTRICITY CHARGES.—The Urban District Council has adopted the following scale of charges for electricity consumed by the tenants of the Shortlands houses:—Five-roomed houses, a fixed weekly charge of 1s. 6d.; four-roomed houses, 1s. 4d.; three-roomed houses, 1s. 3d.; all energy consumed is to be charged at 2d. per kWh or, if a cooker is installed, 1½d. per kWh.

Bristol.—ELECTRICITY SUPPLY.—To meet the demand for electricity in the East district the Electricity Committee has decided to lay two additional cables at a cost of £31,000.

Bury.—ELECTRICITY EXTENSIONS.—Proposals by the Electricity Committee for extensions at the power station, estimated to cost £116,540, have been approved by the General Purposes Committee. The scheme provides for the immediate installation of a new boiler, mechanical stoker, &c., at an estimated cost of £17,450, and also for the replacement of obsolete plant, at an outlay, for the first section, of £99,000. In the latter, provision is made for two 60,000-lb. boilers and a 10,000-kW turbo-alternator.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Department of the Interior has issued a bulletin confirming the estimate made twelve months ago that new hydro-electric installations during 1926 would exceed 250,000 h.p. New installations during the year totalled 266,000 h.p., bringing the total for the installations in Canada to 4,556,000 h.p. The new installations represent a direct capital investment exceeding $25,000,000, irrespective of the further capital required in the application of power to industrial purposes. New installations initiated but not completed during the year will add a further 1,700,000 h.p.—*Reuter's Trade Service* (Ottawa).

Chelmsford.—PRICE REDUCTION.—The Electric Supply Corporation, Ltd., has decided to reduce its charges for the supply of electricity for power and heating purposes so that the maximum charge shall not exceed 2½d. per kWh.

Continental. — SWITZERLAND. — The Bundner Kraftwerke Gesellschaft has recently put in operation a new hydro-electric power station, known as the Klosters, which utilises the water power of Lake Davos. The initial plant has a capacity of 10,000 h.p., but the buildings have been so constructed that the capacity may eventually be extended to 30,000 h.p. The Klosters plant is being worked in parallel with the Kublis station, the electricity generated being transmitted to the distribution system of the North-East Switzerland Power Co., and the municipal authorities of Zurich.

LUXEMBURG.—A Bill which has recently been placed before the Luxemburg Parliament relative to the general electrification of the Grand Duchy includes the scheme submitted by the Société des Centrales Electriques des Flandres, of Brussels. The Government has been in negotiation with the Belgian company, and has drawn up an agreement which now only awaits the sanction of Parliament.

Crediton.—ELECTRICITY SUPPLY.—The Urban District Council on January 4th decided to press the Electricity Commissioners for a reply within 14 days with regard to proceeding with the scheme for providing the town with an electricity supply from Exeter.

Eastbourne.—LOANS SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £20,000 for the installation of boiler plant at the electricity works, and £52,671 for sub-station buildings.

Guildford.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £125,000 in connection with the erection of a new power station.

Hants.—PROPOSED NEW POWER STATION.—A joint committee has been formed to consider a proposal to provide a central power station for the supply of electricity over a large area, including Aldershot, Farnborough, Fleet, Frimley, Farnham, and Hartley Wintney.

Liverpool.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £20,000 for the provision of rotary convertors.

ELECTRICITY SUPPLY.—The city electrical engineer has reported as to the change over to a.c. supply in an outer district, and the provision of a sub-station and equipment at an estimated cost of £2,000, structural alterations at an approximate cost of £300, and the provision of the necessary h.p. and l.p. mains at an estimated cost of £5,653. He has been authorised to carry out the work forthwith.

"ALL-ELECTRIC" HOUSES.—The Corporation has now completed 186 "all-electric" houses. Between 3,000 and 4,000 houses are now electrically equipped.

London.—ELECTRICITY CHARGES.—The North Metropolitan Electric Power Supply Co. has notified consumers that, although the increased cost of coal, due to the coal dispute, has caused heavy expense to the company, it is not intended to make any increase in the charges for supply.

Manchester.—PROGRESS DURING NOVEMBER.—During the month of November the Corporation electricity undertaking showed an increase in connections of 3,027 kW, bringing the total to 296,889 kW; and the number of applications received for supply, including consumers for additional supplies, was 1,275, representing a total of 3,542 kW. The number of hired cookers connected increased by 176, bringing the total actually on circuit to 2,499. Applications for the hire of cookers totalled 189. Three new sub-stations were put into commission during the month and two 750-kW motor convertors were installed at Chorlton-cum-Hardy and Cheetham Hill sub-stations.

SUPPLY TO HOUSING ESTATE.—An application has been received from the Phormium Co., of London, for a supply of electricity to be furnished to 400 houses which are to be erected at Burnage.

Monks Kirby.—ELECTRICITY SUPPLY.—The Leicestershire and Warwickshire Electric Power Co. has asked the Rural District Council for its consent to a Special Order to supply electricity in its area. The Council objects to the use of overhead mains across fields, and the question of supporting the application has been deferred pending inquiries into the probable results of the use of overhead lines.

Ossett.—ELECTRICITY IN BULK.—The Housing Committee is inquiring as to the possibility of obtaining a bulk supply of electricity for lighting the houses on the Council's estate.

Peterborough.—NEW PLANT.—The electrical engineer (Mr. H. A. Nevill) has submitted a report to the Town Council in which he recommends additions to the new power station by the installation of a further turbo-generator of 10,000 kW, which will raise the total capacity of the plant to 18,500 kW. The contracts already entered into in connection with the new power station amount to £176,620, and the expenditure on the proposed extension is estimated at £63,551, making a total of £240,171. The report was adopted at a recent meeting of the Council.

LOAN.—Application is being made for sanction to a loan of £1,637 for laying a main to provide an electricity supply to the Central Sugar Company's factory at Woodston.

Preston.—SUPPLY TO DOCKS.—On the recommendation of the Ribble Committee the Town Council has decided to light the offices and workshops at the Dock by electricity.

South Africa.—PAARL (CAPE PROVINCE).—The electricity supply for this town was until recently obtained from water power derived from the catchment area of the Paarl mountain. The water supply proved to be insufficient for the increasing demand, and it was first proposed to build a new power station operated by steam, gas, or oil, which would have involved a capital outlay of £50,000. It was decided eventually to take a supply from the Electricity Commission's new power station at Salt River, near Cape Town, and the Commission has erected a transmission line 34 miles in length to convey the energy at a pressure of 33,000 V to Paarl, where it will be stepped down to 3,300 V before it is delivered to the municipal switchboard. As the Salt River station will not be completed for some months, a temporary supply is being obtained from the Cape Town Dock road station.

SWELLENDAM (CAPE PROVINCE).—At a recent poll of ratepayers, the Municipal Council was authorised to raise a loan of £15,000 for an electricity scheme for the town.

Special Orders.—Application has been made to the Electricity Commissioners by Colchester Corporation for a Special Order authorising it to supply electricity in the urban districts of Brightlingsea, West Mersea, and Wivenhoe, and parts of the rural districts of Lexden and Winstree, Maldon and Tendring, and Samford.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the East Dereham Urban District Council to supply electricity in its area.

Stourport.—NEW POWER STATION.—The new power station of the Shropshire, Worcestershire, and Staffordshire Electric Power Co. is nearing completion, and it is hoped that it will be formally inaugurated early in the spring.

Torquay. — ELECTRICITY SUPPLY. — The Electricity Committee has adopted a recommendation of the engineer to change over and improve the system of supply at Knowles Hill from a.c. to d.c. by the erection and equipment of a new sub-station and the provision of new l.p. mains, at a total estimated cost of £890.

Wakefield.—LOAN.—The Electricity Committee is applying for sanction to the borrowing of £15,000 for mains and services.

Wessex.—ELECTRICITY SCHEME.—The *Financial Times* reports that a Bill to confer Parliamentary powers on a new electricity company operating in six counties has been deposited for next session in the Private Bill Office of the House of Commons. It is proposed to incorporate the Wessex Electricity Company for the purpose of supplying electricity within certain areas in the counties of Oxford, Buckingham, Berks., Southampton, Wiltshire, and Gloucester.

Wimbledon.—NEW SUB-STATION EQUIPMENT.—The Electricity Committee has prepared a scheme for enlarging and re-equipping the sub-station and constructing 17 new transformer stations, at a total cost of £25,000.

Winchester.—WIRING OF SMALL HOUSES.—The Rural District Council has consented to the municipal houses in the villages of Itchen Abbas and Easton being wired for electricity, which will be supplied by Sir John Shelley-Rolls, Bart., at a charge similar to that at Winchester. The wiring of the houses is being carried out by A. W. Sclater & Son, of London, and the cost per house for wiring and meter is about £25.

Wirral.—ELECTRICITY SUPPLY.—The supply of electricity in the rural area, in accordance with the agreement between the Birkenhead Corporation and the Wirral Rural Council, will be carried a step further as the result of the recommendation of the Birkenhead Electricity Committee for the immediate expenditure of £7,338 for cables and the laying of a h.p. feeder from Upton to the proposed Moreton sub-station.

Yarmouth. — ELECTRICITY EXTENSIONS. — The Corporation Electricity Committee is to proceed with an electricity extension scheme involving an outlay of over £60,000.

Tramway and Railway Notes.

Belgian Congo.—RAILWAY ELECTRIFICATION.—Although the Matadi-Leopoldville railway in the Belgian Congo is at present being worked by steam, it is proposed when the traffic attains a total of 1,200,000 tons a year to electrify the line. The question of utilising the water power resources of the Lower Congo, and in particular the Inkissi and M'Poso falls, for the generation of the necessary electricity, is being inquired into.

Bradford.—FARES.—According to the *Manchester Guardian*, important alterations in tramway fares on the Corporation system are recommended by the Tramways Committee. They include raising all 1½d. fares to 2d., the reduction of 2½d. and 3d. fares to 2d., fixing the maximum fare at 3d. instead of 6d., and the issue of six-day non-transferable passes for the 2d. stages at 2s. 6d. Revision of 'bus fares is also recommended. Mr. R. H. Wilkinson, the tramway manager, states that the net result of the changes would be an increase in income of £20,000 a year.

NEW TRAMCAR DESIGN.—A tramcar, designed by Mr. R. H. Wilkinson, city tramway general manager, which has been under construction at the Corporation depôt at Thornbury, is to be given a trial in February. It is a single-deck car, with seating for 60 passengers, and capable of travelling 25 per cent. faster than the present double-deck cars. The car is divided into smoking and non-smoking compartments, the entrance being in the centre.

Burnley.—NEW ROUTE.—The Town Council has considered a proposal for laying a tramway track at The Centre. The scheme entails an expenditure of £8,600, of which £5,000 will be expended on the track and £3,600 for road works.

India.—RAILWAY POWER STATION.—The Great Indian Peninsula Railway has decided to construct an independent power station in connection with its scheme for electrifying the lines between Bombay and Igatpuri and Bombay and Poona. A site has been chosen in Kalyan, about 20 miles from Bombay. The estimated cost of building and equipping the station is Rs.100 lakhs, of which Rs.90 lakhs will be spent on generating plant and transmission lines. The order for these will be placed in England through the High Commissioner for India. —*Reuter's Trade Service* (Bombay).

Leeds.—NEW TRAMWAY DEPOT.—In the face of substantial opposition, the City Council on January 5th approved a Tramways Committee recommendation that a scheme to apply for sanction to borrow £137,500 for building and equipping an extension to the central tramway depôt in Swinegate be referred to the Finance and Parliamentary Committee. It was pointed out by the Tramways Committee that the scheme was to provide accommodation for 200 cars at a depôt now housing only 50.

London.—NEW TUBE SCHEME.—A scheme to improve communication between the western districts of London and the City will shortly be put in hand by the Underground companies, and will probably take about two years to complete. It provides for the duplication of the lines between Hammersmith and Acton Town and the provision of a junction, by means of a tunnel under Hammersmith Broadway, with the Piccadilly Tube, so that trains on this system may run through to stations west of Hammersmith.

Middlesex.—'BUS OWNERS' PROPOSAL.—The *Financial News* reports that in view of the expiry in 1930 of the lease by the Middlesex County Council of the North London tramways to the Metropolitan Tramways Co., the Association of London Omnibus Proprietors has put forward a proposal to provide an omnibus service should the lease not be renewed. The suggestion is made in a letter to the Minister of Transport and the Middlesex County Council by Sir Charles Cleveland, secretary of the Association which represents the non-combine 'bus owners. In this letter he states that the Association is ready and desirous to take part in any scheme for dealing with the passenger traffic now carried by the trams. The letter states that the Association would be prepared to participate in a reasonable scheme of compensation by annual tax or donation to the County Council for loss of revenue due to non-renewal of the lease to the tramways company.

Middlesbrough.—TRAMWAY IMPROVEMENTS.—The Tramways Committee has decided to relay the tramway track in Linthorpe Road, and also to purchase, at an estimated cost of £18,000, 18 one-man-controlled 'buses to link up other parts of the town.

United States.—RAILWAY ELECTRIFICATION.—The *Electric Railway Journal* states that engineers who have been preparing plans for the electrification of some of the lines of the Reading Company at Philadelphia are expected to have their report completed early this year. Before the survey is submitted, officials at the Reading Terminal anticipate, the preliminary plans for replacing steam by electricity will be completed, covering the electrification of approximately 40 miles of line on the Chestnut Hill, Bethlehem, and New York branches of the Reading system. The new service will be introduced on the New York branch to Trevose, Pa., a distance of 20 miles from Philadelphia.

Telegraph and Telephone Notes.

Austria.—LINK IN ENGLAND-INDIA CHAIN.—The opening of the Vienna-Nuremberg telephone line on January 4th connected Austria with the main telephone systems of Western Europe. The new line will form an important link in the extension of the telephone from Great Britain across the Continent to the Black Sea, Persia, and India. It is hoped to open a direct service between Vienna and London in April; next year the Austrian system will be connected with those of Hungary, Yugo-Slavia, Italy, Switzerland, and Czecho-Slovakia.—*Reuter* (Vienna).

RADIO-TELEGRAPHY.—The Radio-Austria Gesellschaft, which maintains the foreign wireless-telegraph service in Austria, continues to make good progress. During the past year a third transmitter (25-kW Marconi) was installed at the Deutsch-Altenburg transmitting station. The receiving station at Laaer Berg was reconstructed and connected to the local municipal electricity supply mains. A short-wave transmitter has also been installed for experimental purposes. The average number of messages dealt with increased from 939 per day in 1924 to 1,708 in 1925.

Belgium.—TELEGRAPH BILL.—The Ministry of Posts and Telegraphs is preparing the draft of a Bill, which will probably be placed before Parliament about the end of this month, for the creation of a separate and autonomous administration of telegraph and telephone services, says *The Times*. The measure would provide the services with an accounts department on an industrial basis, and would empower the administration to borrow for extension purposes. Five companies have offered to provide the State with the necessary credit for the development of its plant, two of which would supply apparatus and the other three the cables required for extending the system. Payments would be spread over a period of five years, the first instalment becoming due six months after the completion of the works, and subsequent instalments every six months thereafter. This arrangement would enable the State to defray the cost of the new installations with the additional receipts which they would yield.

Borneo.—TELEPHONE EXTENSION.—A telephone system is planned to connect Bandjermasin (the principal port and city of south Borneo) with the interior towns of Martapoera Rantau, Kandangan, Barabai, Berajang, and Amoentai.

Hull.—TELEPHONE LOAN.—The Ministry of Health was to hold an inquiry on January 11th into the application to borrow £38,700 for the extension of the telephone system, the only municipal service in this country.

Mexico.—TELEGRAPH CONSTRUCTION.—The Telegraph and Postal Department of the Mexican Government will shortly call for tenders for the modernising of the entire telegraph and radio-telegraph systems of Mexico. Fourteen additional radio-telegraph stations will be installed, or acquired, and a considerable amount of equipment, including repair tubes, transmitters, and receivers, will be ordered.—*Reuter's Trade Service* (Mexico City).

Radio-Telegraphy.—"BEAM" STATIONS READY.—The short-wave "beam" telegraph stations which have been built by Marconi's Wireless Telegraph Co. on behalf of the General Post Office at Grimsby and Skegness for communication with Australia are now ready for handing over to the authorities for a seven-days' official test.

Radio-Telephony.—"BEAM" TESTS.—The first link in a possible Empire wireless-telephone "chain" was forged at noon on January 10th, when Commander C. P. Edwards, chief of the Canadian Radio Telegraph Service, talked to Mr. R. N. Vyvyan, chief engineer of the British Marconi Co., at Bridgwater, Somerset. The stations used in this demonstration were apparently those built by Marconi's Wireless Telegraph Co., Ltd., for the British Post Office "beam" radio-telegraph service between England and Canada, which service was successfully inaugurated last month.

The Telephone Service.—NEW AUTOMATIC EXCHANGE.—Although Middlesbrough itself still relies upon the services of operators for local telephone service, the neighbouring village of Marton-in-Cleveland, three miles south, has enjoyed the advantages of an automatic service since 1922, when a Strowger exchange was installed there for the Post Office by Automatic Telephone Manufacturing Co., Ltd., to serve about 80 subscribers, and comprised a Keith line-switch unit equipped with final selectors on the reverse side, the system being then 2-digit. The new equipment, which has also been supplied and installed for the Post Office by Automatic Telephone Manufacturing Co., embodies modern rotary line switches and has a present capacity of 245 lines, consisting of 150 regular subscribers, 90 p.b.x., and five coin-box lines. Moreover, in anticipation of the future conversion of Middlesbrough, provision has been made in the new Marton equipment for 5-digit calling.

CONTINENTAL SERVICE.—Work on the new Anglo-German telephone cables has been completed, and the service is now available between this country (both London and the provinces) and all parts of Germany.

Radio Notes.

Australia.—NO COMMISSION OF INQUIRY.—In the opinion of the P.M.G., Mr. Gibson, there is no necessity for the appointment of a Royal Commission to inquire into wireless matters in Australia, as was advocated by the Association for the Development of Wireless. "There is no need for any more Government control than what is provided for under present regulations," he added.

RESEARCH.—Important proposals were agreed to at a conference called by the Council of Scientific and Industrial Research recently. It was agreed to recommend that immediate steps be taken in Australia to form a Wireless Research Board, attached to the Council.

Denmark.—LICENCES.—Over 92,000 licensed receiving sets, about 44,660 of which are valve sets, are now operating in Denmark, according to a recent announcement made by the Government Control Board. Practically 90 per cent. of all the sets are in Copenhagen and its suburbs, says *Commerce Reports*, most of them being of the crystal type. It is expected that with a more strict enforcement of the licence law the figures for receiving sets in Jutland will show a great increase.

RELAY STATION.—The present station in Copenhagen, which broadcasts on a wave-length of 337 m., will in the near future use a new transmitter built by Danish firms. The energy will be 1 kW, and it will act as relay for Copenhagen and its suburbs in co-operation with the new high-power station now under construction near Kalundborg, which will be working next autumn with 7.5 kW aerial power. *World Radio* says that the provision of other relay stations will not be discussed until the Radio Council has experience to what extent the new high-power station will give satisfactory reception in the different parts of Denmark.

France.—NEW STATION.—It is reported that a 5-kW radio broadcasting station is to be constructed at Nice, and it is expected that the station will be in operation early in 1927.

Hungary.—DEVELOPMENTS.—Great improvements are being made in the Budapest station, which celebrated its first birthday on December 1st. The aerials are being raised, literally, and their capacity increased to 3 kW. By October the new transmitter, with a capacity of 20 kW, will be ready. The Post Office and Telephone Administration controls all broadcasting in Hungary, and according to *World Radio* the Minister of Education has ordered receivers to be supplied to all schools if funds permit, and the Minister of the Interior that all hospitals shall be supplied with equipment, including loud-speakers, at the State's expense. All Budapest municipal blocks of dwellings are also to be furnished with radio sets.

Reality in Reception.—BIRMINGHAM DEMONSTRATION.—Interesting and somewhat novel demonstrations are to accompany a short series of talks on "Reality in Broadcast Reception," which Mr. Colin H. Gardner, of Midland Radio-Telephone Manufacturers, Ltd., commenced from the Birmingham broadcasting station on January 13th, and is to continue on January 27th and February 10th. The demonstrations are to be given for the purpose of enabling listeners to ascertain what distortion is being caused in their receivers, where it is located, and how to remedy it, and, further, to enable listeners to measure the musical range of their sets. The tests will be of an ingenious nature, and should be of material assistance to listeners anxious to get the best possible results from their receivers. In the first tests, distortion will be deliberately introduced in the studio; there will be a preliminary transmission with the transmitter working at its best, sending out evenly-balanced and full-bodied music; the same piece will then be transmitted again, but with a certain proportion of the bass diminished. If the listener notices no appreciable difference, the test will tend to prove that the particular proportion of bass was never reproduced by the receiving apparatus. The more obvious causes of frequency distortion, such as may be due to the over-loading of valves, resonance in loud-speakers or 'phones, and the use of wrong voltages or excessive reaction, will then be dealt with. Gramophone records will be used for the demonstrations, made by the new electrical recording process, and in order to overcome machine noises a Marconiphone magnetic pick-up device will be substituted for the ordinary sound-box. This actually constitutes a minute electric generator, the output of which is varied by the vibrations of the gramophone needle as it passes over the record. The modulated current from this device is passed into a special amplifier, with resistance-capacity coupling, volume control at the input, and a series of filter circuits which enable the operator to vary the balance of tone at will by diminishing or strengthening any particular set of musical frequencies. The music, thus controlled, will be passed into any one of a row of loud-speakers of different types, the reproduction of which is received in the usual way by the studio microphone, and broadcast. It is of interest to note that the output characteristic curve of the Birmingham station's transmitting apparatus shows a straight portion between 50 and 10,000 cycles, which means an even degree of amplification over practically the whole of the fundamental audible-frequency range.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—February 28th. City Council. Two 2,500-kW motor-convertors and accessories, or two 2,500-kW rotary convertors, with transformers and accessories. (B.X. 3124.)*

March 14th. 6,600-V, 3-phase switchgear. (B.X. 3138.)* Postmaster-General's Department.

March 8th. Induction coils and registers (B.X. 3136), testing instruments (B.X. 3132.)* State Electricity Commission of Victoria.

March 7th. Paper-insulated, lead-covered control cable. (B.X. 3137.)*

March 14th. D.c. switchgear and accessories. (B.X. 3131.)*

Argentina.—BUENOS AIRES.—February 24th. Department of Navigation and Ports. Three 10-ton electric shunting locomotives (Diesel type). (A.X. 4016.)*

March 24th. Electric cranes, pumps, &c. (A.X. 4087.)*

March 15th. Ministry of Marine. Electrical machinery in connection with the extension of electrical generation (involving the enlargement of two existing power stations and the construction of two new ones) at the Naval Base, Puerto Belgrano. (B.X. 3140.)*

Askern (near Doncaster.—January 18th. Electric lighting installation at Sutton Road new school. Education Department, West Riding County Hall, Wakefield.

Barnes.—February 8th. Electricity Department. One 1,000-kW rotary or motor convertor with transformer, l.p. switchgear and connections. (January 7th.)

Bootle.—January 18th. Corporation. Electrician's work required in erection of 16 lock-up shops, with 16 flats above, Bailey Drive. Particulars from Borough Engineer, Town Hall.

Burnley.—January 27th. Tramways and Omnibus Department. General stores for 12 months. Schedules from the General Manager, Queensgate Depôt, Burnley.

Bury.—Bury District Co-operative Society. Power and lighting installation at new dairy, Georgiana Street. Mr. C. R. Cooper, architect, 20, Market Street, Bury.

Canada.—GREAT FALLS.—January 17th. Manitoba Power Co., Ltd. Three 7,000-kVA single-phase oil-insulated indoor-type transformers for Lac du Bonnet, Manitoba. (B.X. 3118.)*

Clacton.—February 2nd. Electricity Department. Two 1,125-b.h.p. Diesel oil engines, direct coupled to 750-kW, 3-phase alternators; two 750-kW alternators, two rotary-converters, and e.h.p. switchgear. (See this issue.)

Dundee.—January 21st. Electricity Department. E.h.p. and l.p. cable. (See this issue.)

Ecuador.—QUITO.—Municipal Council. 3,000-h.p. hydro-electric plant for which water power with a fall of 42 metres is available, to be owned and worked by the city authorities. A second installation of similar capacity, for the port and city of Guayaquil, is also contemplated.

Edinburgh.—January 25th. Edinburgh District Board of Control. Electric lighting installation at Bangour Mental Hospital. Mr. J. D. Gibson, surveyor, 60, Frederick Street, Edinburgh.

February 14th. Electricity Supply Department. E.h.p. and l.p. switchgear, e.h.p. and pilot cables. (See this issue.)

Greenock.—January 20th. Corporation. Electric lighting installation in 36 houses. Office of Public Works, Municipal Buildings.

India.—India Store Department. January 25th. Overhead electric travelling cranes. Specifications (5s.) from 15, Belvedere Road, Lambeth, S.E.

10 miles dry core telephone cable. (See this issue.)

Liverpool.—January 27th. Electricity Supply Department. Twelve months' supply of materials, including cables and accessories, insulated cables, meters, lamps, &c. (January 7th.)

London.—STEPNEY.—January 18th. Board of Guardians. Electric goods lift at the St. George's-in-the-East Hospital. (December 31st.)

Manchester.—January 31st. Electricity Department. Two electrically-driven circulating-water pumps, piping, &c. (See this issue.)

Newport (Mon.).—February 5th. Electricity Department. Two water-tube boilers, steam and feed-water piping, economisers, air heaters, induced- and forced-draught plant, steel stack and grit catcher, coal and ash conveyors, extension of boiler house, including structural steelwork and foundations. (January 7th.)

New Zealand.—DUNEDIN.—February 19th. City Corporation Gas Department. One motor-generator with control board and accessories. (B.X. 3095.)*

Salford.—January 22nd. Corporation. Electric lighting installation at Wash-house and Slipper Baths, Hodge Lane. Mr. Chas. Swain, architect, 12, Exchange Street, Manchester.

Sleaford.—Electricity Works. 50 tons Diesel oil fuel. (See this issue.)

South Africa. — PRETORIA. — February 3rd. Municipal Council. E.h.p. cable and accessories, switches and cut-outs. (B.X. 3097.)*

JOHANNESBURG.—January 20th. Municipal Council. Supply of electric lamps. (B.X. 3112.)*

February 10th. Electric cable. (B.X. 3130.)*

Stoke-on-Trent.—February 8th. Stoke and Wolstanton Union. Alterations and additions to the central-heating and hot-water services at the London Road Institution. The work includes large calorifiers, two electric generating sets, pumps, &c. Specification from Mr. T. Wood, clerk to the Guardians, Union Offices, Stoke-on-Trent.

February 9th. Electricity Department. Steam and water piping, valves, &c., constructional steel work, platforms, crane gantries, &c. (January 7th.)

Uruguay.—MONTEVIDEO.—February 18th. State Electricity Works. 65,000 kg. unvarnished black iron wire and 10,000 kg. g.i. wire. (A.X. 4019.)*

February 11th. 37,500 electric filament lamps. (B.X. 3117.)*

February 15th. 55,500 iron pieces (angles, ties, bolts, &c.) for overhead lines. (A.X. 4018.)*

Beckenham.—Electric signs and lamps at the Public Hall. U.D.C. Surveyor.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—Electricity Supply Committee. Recommended :—

L.p. underground cables (Spec. 1064) (£27,236).—Enfield Cable Works (Aust.), Ltd.

10,000-V cables for 33,000/10,000-V sub-stations (items 2, 3, 4 (£3,461).—British Insulated Cables, Ltd.

33,000-V cables (items 5 and 6) (£1,234).—British General Electric Co., Ltd.—*Tenders.*

Birkenhead.—Electricity Committee. Accepted:—

"Ironclad Exide" battery (£192).—Chloride Electrical Storage Co., Ltd.

H.p. feeder from Upton to Moreton sub-station (£1,150).—W. T. Henley's Telegraph Works Co., Ltd.

Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£7,289); Hackbridge Cable Co., Ltd. (£1,732).

Bradford.—Tramways Committee. Accepted:—

30 tons Peckham hand-brake shoes, and 30 tons track-brake blocks (£600).—Yorkshire Repetition Castings Company.

140 steel tramway poles (£2,332).—British Mannesmann Tube Co., Ltd.

36 tramcar split gear wheels (£214).—British Hele-Shaw Patent Clutch Co., Ltd.

Evesham.—Town Council. Accepted:—

Installing electric lighting at the Public Hall.—Abell and Smith, Ltd.

Finchley.—Electricity Committee. Accepted:—

Motor balancer.—Electric Construction Co., Ltd.

Glasgow.—Health Committee. Accepted:—

Heating installation at Mearnskirk Sanatorium—

Turbines and generators.—W. H. Allen, Sons & Co.

Switchboard.—William McGeoch & Co.

Hull.—Electricity Committee. Accepted:—
Intercommunication telephone system at Sculcoates (£634).—Relay Automatic Telephone Co.

Baths Committee. Accepted:—
Heating fittings and pipes for electrical vapour baths at Beverley Road (£791).—J. V. Coonan & Co.

Telephones Committee. Accepted:—
Cable (£126).—W. F. Dennis & Co.

Leeds.—Tramways Committee. Accepted:—
Conduits (£1,391).—Leeds Fireclay Co., Ltd.
Tram bolts (£645).—Stewarts & Lloyds, Ltd.
Grooved cadmium-copper trolley wire (£105).—Richard Johnson & Nephew, Ltd.

Electricity Committee. Accepted:—
Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£2,016); Enfield Cable Works, Ltd. (1,599); Macintosh Cable Co., Ltd. (£4,602).

Sewage Committee. Accepted:—
Extension of electric lighting at Knostrop.—Wilson Hartnell Installation, Ltd.

Museums Committee. Accepted:—
Electric lighting improvements at Museum.—R. F. Winder, Ltd.

London.—London Power Co., Ltd. Accepted:—
Ten 4,000-kVA single-phase transformers, with switchgear for tap changing on load.—Ferranti, Ltd.

ADMIRALTY.
Night-sight lamps.—Edison Swan Electric Co., Ltd.

BOOTH STEAMSHIP CO.
Twelve months' contract for "Osram" metal-filament vacuum and gasfilled lamps and "Robertson" carbon-filament lamps.—General Electric Co., Ltd.

SOUTHWARK.—Electricity Committee. Accepted:—
Repairs to cooling tower (£360).—Davenport Engineering Co., Ltd.

HACKNEY.—Electricity Committee.
One 10-ton overhead travelling crane (£203).—Herbert Morris, Ltd.

The Metropolitan Asylums Board has decided to install six electrically-driven sewing machines at the Brook Hospital, at £170.

Liverpool.—Tramways Committee. Recommended:—
25,000-kW turbo-alternator, with condenser (£110,573).—Metropolitan-Vickers Electrical Co., Ltd.
Two cooling towers (£21,289).—J. Henshaw & Co.

Manchester.—Tramways Committee. Accepted:—
Telescoper pit bogie for handling tramcar motors.—Equipment & Engineering Co.
Steel girder tram rails.—Cargo Fleet Iron Co., Ltd.; Bolckow, Vaughan & Co., Ltd.
Special trackwork.—Titan Trackwork Co., Ltd.

Education Committee. Accepted:—
Electric lighting installation at Gorton Mount Municipal School.—E. Crossley.

Housing Committee. Accepted:—
Electrical installation at houses on Broadway housing estate.—J. V. Pyatt.

Mold.—Urban Council. Accepted:—
Installing electric light at the Town Hall, Market Hall, and public lavatories.—Mr. Alfred Jones (Caergwrle).

Oldham.—Electricity Committee. Accepted:—
Earthenware conduit.—Doulton & Co., Ltd.
A.c. motors.—English Electric Co., Ltd.

Reigate.—Town Council. Accepted:—
Wiring houses on the metal-sheathed system at 15s. per point (12 months' contract).—T. S. Marriage & Co.

Stoke.—Electricity Committee. Accepted:—
Overhead wiring and services to 120 houses on Abbey Hulton Bay Estate (£422).—Barnett & Soans.

Electricity Supply Charges.

Electricity supply authorities, who have already been urged here to bring down their charges again as soon as possible so as to facilitate the progress of domestic business, will have noted that the Gas Light & Coke Co. has just announced that 1.4d. of the 2.2d. per therm added to the price of gas since the coal stoppage began, is to be taken off as from the reading of the indices in March next. The company describes this as the first step in the return to normal prices.

Forthcoming Events.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, January 14th. Literary and Philosophical Society, Newcastle-on-Tyne. 6 p.m. "Progress in Economy of Turbine Machinery on Land and Sea." Sir Chas. A. Parsons and Mr. R. J. Walker.

Junior Institution of Engineers.—Friday, January 14th. 39, Victoria Street, S.W. 7.30 p.m. "The Thermionic Valve and its Characteristics." Mr. R. L. Kirlew.
Friday, January 21st. 6 p.m. Exhibition of Scientific Instruments and Apparatus.

Women's Engineering Society (Inc.).—Friday, January 14th. 41, Cadogan Square, S.W.1. 6.15 p.m. "Measuring Stress by Aid of Polarised Light." Prof. E. G. Coker, F.R.S.

Institution of Automobile Engineers.—Monday, January 17th. Royal Technical College, Glasgow. "Electric Lighting for Public Service Vehicles." Mr. G. E. McCaw.

Paisley Association of Electrical Engineers.—Tuesday, January 18th. Town Hall, Paisley. 7.30 p.m. "Electrical Industry in U.S.A." Mr. R. Hardie.

Institute of Wireless Technology.—Wednesday, January 19th. Engineers' Club, W. 7 p.m. "Some Absurdities of Wireless Nomenclature." Dr. F. T. Fawcett.

Electrical Power Engineers' Association (North-West Midland Section).—Wednesday, January 19th. Engineering and Scientific Club, Wolverhampton. 8 p.m. "Overhead Distribution." Mr. T. A. G. Margary.

Institution of Electrical Engineers.—Thursday, January 20th. London. 6 p.m. "33,000-V Cables with Metal-sheathed Cores, with Special Reference to the S.L. Type." Mr. P. Dunsheath.

(North-Eastern Centre).—Monday, January 17th. Armstrong College, Newcastle-on-Tyne. 7 p.m. Faraday Lecture, "What is Electricity?" Prof. W. M. Thornton.

(North-Western Centre).—Tuesday, January 18th. Midland Hotel, Manchester. 6.45 for 7.15 p.m. Annual dinner.

(South-Midland Centre).—Wednesday, January 19th. University, Birmingham. 7 p.m. "Electrical Equipment of Track on the Underground Railways of London." Mr. A. R. Cooper.

(East-Midland Sub-Centre).—Tuesday, January 18th. Technical College, Derby. 6.45 p.m. "Telephone Repeaters." Mr. R. M. Chamney.

(Sheffield Sub-Centre).—Wednesday, January 19th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "The Electricity Bill." Mr. H. E. Yerbury.

(Tees-Side Sub-Centre).—Monday, January 17th. Cleveland Technical Institute, Middlesbrough. 7 p.m. "Wired Wireless." Mr. L. C. Grant.

(South-Midland Students' Section).—Tuesday, January 18th. Temperance Hall, Temple Street, Birmingham. 7 p.m. Annual film exhibition.

(London Students' Section).—Friday, January 21st. 6.15 p.m. "Automatic Voltage Regulators," Mr. E. B. Watton.

Edinburgh Electrical Society.—Thursday, January 20th. Royal Scottish Society of Art, 117, George Street. 8 p.m. "Electric Lifts." Mr. J. H. Ross.

Meter Engineers' Technical Association.—Friday, January 21st. Lighting Service Bureau, 15, Savoy Street, W.C. 7 p.m. "The Testing of Large-Capacity Meters *in situ*." Mr. W. Casson.

British Electrical Development Association.—Friday, January 21st. Royal Society of Arts. 7.30 p.m. "Industrial Heating." Mr. S. E. Monkhouse.

Institution of Mechanical Engineers.—Friday, January 21st. London. 6 p.m. "The Use and Economy of High-Pressure Steam Plants." Prof. A. L. Mellanby and Prof. W. Kerr.

Association of Mining Electrical Engineers (North of England Branch).—Saturday, January 22nd. Neville Hall, Newcastle-on-Tyne. 3 p.m. "Static Transformers for Collieries." Mr. J. W. Rodger.

(Western Sub-Branch).—Saturday, January 22nd. 60, Wind Street, Swansea. "The Working of Thin Seams with Electrical Power." Mr. D. P. Jones.

Notes.

An Apology.

On page 963 of the ELECTRICAL REVIEW of December 10th last, under the heading of "Meters Sensitive to Music," we quoted a statement alleged to have been made by Mr. J. H. Canning, the engineer and manager of the Newport (Mon.) Gas Company, which we now find was not made by him. We very much regret the annoyance which has been caused to Mr. Canning through the unfortunate error which was made in attributing to him remarks made by another speaker.

Accident Prevention.

In a recent broadcast talk in America, Mr. A. Williams, president of the American Museum of Safety, said that organised safety effort, whether on the railways or in the industrial life of the country, when conducted under the direction of trained men and women, would eliminate by mechanical protection and human training two-thirds of the average number of accidents, with a corresponding percentage in those resulting in fatalities. It was asserted that only 10 per cent. of all the recent accidents could have been prevented by mechanical means, so completely guarded were most industrial processes to-day, and that in almost all other cases accidents were due to the carelessness either of the persons injured or others. From 1907, when safety work in America was begun, to 1925, over 95,000 casualties had been prevented, a reduction of more than 81 per cent., as a result of the organised safety effort in the operation of the American railroads. During the period 1921 to 1924 the saving in money as a result of the decrease of accidents amounted to $116,500,000.

Inventions in 1926.

Messrs. Hughes & Young, patent agents, of London, state that the number of patent applications filed by the end of the year shows only a slight increase over the previous year, but there is a considerable change in the nature of current inventions, as the modern inventor is setting out on entirely different lines from the normal procedure. There has been a large number of patents granted during 1926 for domestic utility appliances, many of which are for inventions by women with a view to minimising and facilitating housework. It is probable that the largest proportion in inventions relate to electrical and wireless appliances, great attention having been given to electric incandescent lamps, cables, and automatic telephone systems.

Accidents.

An accident occurred on January 7th at new works of the London Electric Supply Corporation at Deptford Dry Dock resulting in the death of four workmen and injuries to two others. An official explanation states:—"A shaft was being sunk in compressed air when there was a blow or the entry of a burst of water into the shaft; the four men down below were trapped, and they are believed to be dead. They are buried in mud and water. The tunnel was to have communicated with the river, and water was to have been drawn through the shaft for the power station. The two men who were brought out alive were not so far down as the others." One of the injured men subsequently died.

Three workmen employed at a sub-station of the Southern Railway Co., at Lewisham, received injuries on January 5th as the result of an explosion. Two of the men were taken to Lewisham Hospital suffering from burns on the face and arms. The train services were not affected.

Appointments Vacant.

Junior technical officer (£175+) for the Admiralty experimental establishment; electrical and mechanical foreman (Rs. 700 per month) for the Karachi Port Trust; working foreman (£200) and general assistant (£325) for the Cheadley and Gatley U.D.C. electricity department; senior and junior draughtsmen for the West Midlands Joint Electricity Authority; shift charge engineer for the United Alkali Co., Ltd.; engineer to act as clerk of works and canvasser (£271) for the Prestatyn U.D.C Shift charge engineer for the Corporation of Dover Electricity Department. (See our advertisement pages to-day.)

B.E.S.A. Publication.

A recent specification, issued by the British Engineering Standards Association, No. 97, 1926, for Watertight Fittings and Incandescent Electric Lamps, is a revision of the 1920 edition, and applies to fittings of the bulkhead and well-glass types for use in conjunction with British Standard Lamps, Specification No. 161, having overall lengths not exceeding 150 mm. and 140 mm., respectively. The general clauses deal with the material and its finish, wire entry, earthing screw and lampholder, whereas the sectional clauses deal mostly with dimensions, packing rings and gauging. The dimensions standardised are those essential for interchangeability, but the full details of the design of the fittings are not standardised. It is mainly in the latter feature that the present specification differs from the old edition, wherein the details of the design were very minutely specified. An important item is the standardisation of the screw-thread on the guard and in the body of screw-guard fittings, this being of Whitworth form with 16 threads per inch. In the past great inconvenience has been experienced owing to the existence of an alternative screw-thread having 19 threads per inch, and the universal adoption of the present standard will be to the benefit of both users and manufacturers. Copies of this new specification may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

Midland Students' Ball.

On Tuesday, February 22nd, at 8 p.m., the First Midland Student Engineers' Ball will be held at the Grosvenor Rooms, Grand Hotel, Birmingham. It is being organised for students of the Institutions of Civil, Electrical, and Mechanical Engineers; tickets are 5s. single and 9s. double, and the surplus proceeds will be handed over to the I.E.E. Benevolent Fund. The ticket requirements of the electrical students are being cared for by Mr. S. B. Warder, X Est. Dept., General Electric Co., Ltd., Witton, to whom application should be made immediately in order to prevent disappointment. The music will be by Jack Venables's Band, and the proceedings will continue until 2 a.m.

A Large Battery Locomotive.

The Christmas number of the "Chloride Chronicle" contained a picture of what is believed to be the largest storage-battery locomotive in existence. It is in service on the Chicago and North-Western Railway, and weighs 110 tons. The locomotive is capable of hauling a 1,500-ton train at a speed of from 8 to 10 miles an hour. It is propelled by an "Exide Ironclad" battery weighing nearly 40 tons.

N.A.S.E. Premiums.

The Examining Board of the National Association of Superviaing Electricians for the "Economic Premiums" Competition, 1926, has awarded prizes as follows:—Members' section: First prize, £10, Mr. D. Williams, Pontllanfraith, for paper on "Distribution and Supply Economics"; second prize, £5, Mr. R. W. Whitley, London, "Economics at a Premium"; Associates' section: First prize, £5, Mr. J. Mulcaster, Darlington, "Reduction of Unit Costs"; second prize, £2 10s., Mr. H. J. Kimber, London, "Industrial Relations Between Employed and Employer." The examiners report that the papers received were of a very high standard and showed great appreciation of the difficulties facing the electrical industry generally.

Train Collision Report.

We have received a copy of the report of the official inquiry into the causes of the collision between a passenger train and an empty churn train which occurred on November 4th last between Farnborough and Fleet on the Southern Railway. It appears that the sudden stopping and starting of the milk train, as a result of the operation of the signals in front of the train from danger to clear as soon as the train had pulled up, resulted in a break-away of the rear trucks. Apparently the driver of the passenger train, who was killed in the accident, failed to observe or act upon the danger indication of the signals just in the rear of the goods train, and the distant signal had been in the clear position when he passed it. It is suggested that the accident would have been prevented if automatic train control had been in use in connection with the distant signal.

Institution Notes.

Institution of Electrical Engineers.

A.M.I.E.E. EXAMINATION.—The next examination will be held on March 30th and 31st and April 1st, 1927. Candidates must be either Students or Graduates of the Institution, or have lodged with the secretary a duly-completed form "E" for election as Associate Member. Entry forms for the examination, which must be completed and returned by February 1st, and particulars regarding election to membership of the Institution, may be had on application to the secretary.

WESTERN CENTRE.—An Monday last the annual dinner of the Centre was held at the Royal Hotel, Bristol. A report of the proceedings will appear in our next issue.

Royal Institution.

On Tuesday next (January 18th), at 5.15 p.m., Professor R. Whytlaw-Gray begins a course of two lectures on "Smokes as Aerial Disperse Systems." The Friday evening discourse on January 21st will be delivered by Sir William Bragg on "Tyndall's Experiments on Magne-Crystallic Action."

Institute of Metals.

At the annual general meeting, to be held in London on March 9th and 10th, seventeen papers are to be submitted. In the evening of March 9th the annual dinner of the Institute will take place at the Trocadero Restaurant, followed by a dance. The annual autumn meeting of the Institute will be held at Derby in September. The membership on December 31st was 1,801, as compared with 1,692 a year previously.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

Recent changes of appointment in the staff of Metro-Vick Supplies, Ltd., are as follows:—Mr. N. V. EVERTON, secretary of the company, has, in addition to his previous responsibilities, taken up the duties of district manager, London area, Mr. E. MYHRE having been transferred to the sales management department, head office. Mr. H. A. NORMAN WHITE, who has been for some time sales engineer on the North London territory for the company, has been appointed to take charge of the Manchester office of Metro-Vick Supplies, Ltd. Mr. H. FILDES has been appointed to the domestic appliance department, specially handling the sale of electric cookers for the North of England.

Mr. J. G. MCLEAN, who has joined Industrial Combustion Engineers, Ltd., of 31-37, Wybert Street, Munster Square, N.W.1, was from 1900 to 1911 chief engineer and general manager of the Woking Electric Supply Co., Ltd.

Mr. A. H. DARKER, A.M.I.M.E., A.M.I.E.E., chief electrical engineer of Messrs. J. Stone & Co., Ltd., who, as already stated here, has been making a world tour, has now returned to London.

Mr. CHARLES VERNIER, of the Newcastle-upon-Tyne Electric Supply Co., Ltd., is joining the staff of the Macintosh Cable Co., Ltd., as chief engineer, on February 1st.

Messrs. F. COATES and H. W. MILLER have been invited to join the board of Messrs. A. Reyrolle & Co., Ltd. Mr. Coates, who has been with the company from its inception over 25 years ago, has been for many years the head of the drawing and design offices. Mr. Miller, who joined the company in 1920, has for the last few years been acting as general manager.

MR. ALEXANDER FARQUHARSON, of Tayport, Dundee, has been appointed tunnel engineer in the Punjab Public Works Department (hydro-electric branch) under the Indian Government. He served through the whole of the war, and during his service in Egypt he attended college, qualifying in electrical engineering.

The Workington Town Council has increased the salary of Mr. W. A. PARKER, distribution electrical engineer, to £300 per annum, with two annual increments of £25 to a maximum of £350.

ALD. A. HUNTSMAN, of Nottingham, was last week elected for the eighth year in succession chairman of the Joint District Council for the Electricity Supply Industry (No. 7 Area). He was also re-elected chairman of the District Joint Board for the staff.

The Accrington Electricity Committee has appointed Mr. ARTHUR BARLOW manager of the new electricity showroom.

MR. J. H. OSBORNE, of the staff of the British Thomson-Houston Co., Ltd., was recently presented by the staff with a canteen of cutlery upon the occasion of his marriage to Miss W. D. BRINKWORTH.

The Glasgow Corporation Tramways Committee is interviewing Mr. LACHLAN MACKINNON, the present deputy general manager, with reference to the appointment of a successor to Mr. Dalrymple.

Lord MONTAGU OF BEAULIEU has been elected president of the Electromobile Association.

Obituary.—MR. J. C. ROOTHAAN.—Mr. Jan Cornelis Roothaan, whose death was briefly reported here on December 31st, was born at Nymegen, Holland, in 1876. After serving with several Continental firms, among others, Brown, Boveri and the Ateliers de Constructions Electriques de Charleroi, generally on switchgear design, he joined Messrs. Ferranti, Ltd., in 1903, as chief draughtsman of their switchgear department, a few years later becoming chief engineer of their switchgear, transformer, and instrument departments. In September, 1916, when returning from a business trip from Amsterdam, he was taken prisoner by the Germans. The severe privations endured probably laid the foundations of the disease which ultimately caused his death at the early age of fifty years. After his return to England early in 1919, he joined the British Electric Transformer Co., Ltd., where he devoted himself to the development of transformers of core type construction. Mr. Roothaan's death leaves a distinct gap among his friends and colleagues of the British Electric Transformer Co., Ltd., where he held an important position as one of the company's chief designers.

SIR FRANCIS FOX.—We regret to record that Sir Francis Fox, M.Inst.C.E., Hon. Assoc. R.I.B.A., the well-known engineer, brother of Sir Douglas Fox, and a member of the firm of Sir Douglas Fox & Partners, passed away on Friday last at Wimbledon at the age of 82 years. Sir Francis was responsible, as engineer or in a special expert capacity, for large railway schemes and many other great works, including the boring of the Simplon Tunnel, the Mersey Tunnel, and the Liverpool Overhead Railway, also the Great Northern and City and the Charing Cross and Hampstead tube lines.

MR. H. T. FOWLER.—We regret to record the death of Councillor H. T. Fowler, who was recently appointed vice-chairman of the Basingstoke Electricity Committee. Mr. Fowler was machine-shop superintendent at the Basingstoke works of Messrs. John I. Thornycroft & Co., Ltd.

MR. A. C. LOXLEY.—We regret to learn that Mr. A. C. Loxley, the Leeds branch manager for the London Electric Wire Co. and Smiths, Ltd., passed away suddenly last week. Management of the branch has been taken over temporarily by Mr. S. A. Pearce.

MR. G. P. VARLEY.—The death occurred on December 29th, of Mr. George Pilkington Varley, J.P., managing director of John Varley, Ltd., electrical and general engineers, of the Waterloo Foundry, St. Helens.

MR. S. L. KILPIN.—The death took place on January 6th, at the age of 72 years, of Mr. Samuel Leach Kilpin, of Kilpin and Billson, electricians, of High Street, Bedford. He served for many years on the Town Council and acted as Mayor in 1907.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Index Lamp Co., Ltd.—Private company. Registered January 6th. Capital, £2,500 in 1,500 10 per cent. preference shares of £1 each and 4,000 ordinary shares of 5s. each. Objects: To acquire the business of an electrical equipment and motor accessories manufacturer, now carried on by T. W. Bennett, of 83, Grove Hill Road, Camberwell, S.E.5, as the "Index Lamp Company." The first directors are:—T. W. Bennett (managing director), 83, Grove Hill Road, Denmark Park, S.E.5; H. Weinbaum, 4, Morgan Street, Bow, E.3.

Electrical Coils, Ltd.—Private company. Registered January 8th. Capital, £100 in £1 shares. Objects:—To carry on the business of coil-winding specialists, electrical, mechanical, and wireless engineers, manufacturers of, and dealers in all kinds of scientific instruments, &c. The first directors are:—F. de Soiza, 4, Felsberg Road, S.W.2; Mrs. Annie E. de Soiza, same address; R. Jones, 18, St. Werburgh Street, Chester. Qualification, 1 share. Registered office: Calders Row, Brixton Hill, S.W.2.

J. Dyson & Co., Ltd.—Private company. Registered January 4th. Capital £20,000 in £1 shares. Objects: To adopt an agreement with J. Dyson, and to carry on the business of manufacturers of and dealers in electrical and wireless equipment, formerly carried on by him at 5 & 7, Godwin Street, Bradford, and that of manufacturers of and dealers in kinematograph apparatus, &c. The subscribers (each with one share) are:—J. Dyson, 289, Toller Lane, Bradford, engineer; and Mrs. W. Dyson, of the same address. J. Dyson is managing director and chairman for five years. Qualification of directors, £1,000. Secretary: L. Hodgkinson, 48, Sunbridge Road, Bradford. Solicitors: Howe, Denby & Bairstow, 38, Piccadilly, Bradford. Registered office: 7, Godwin Street, Bradford.

Millerphones, Ltd.—Private company. Registered January 5th. Capital, £200 in £1 shares. Objects: To carry on the business of motor and electrical engineers, manufacturers of electrical appliances and equipment, petrol and oil engines, telephones, radio apparatus, &c. The first directors are: P. A. Gooding, 16, Cambridge Road, Hammersmith, W.6, engineer. W. T. Miller, company manager, and Mrs. Ida L. Miller, 45, Park Road, Dulwich, S.E.21. Secretary, S. J. Pomeroy, 20, Coverdale Road, W.12. Registered office, 18, Coleman Street, E.C.2.

Accurate Recording Instrument Co., Ltd.—Private company. Registered January 3rd. Capital, £5,000 in £1 shares. Objects: To invent, manufacture and deal in gauges, valves, indicators, instruments and tools of all kinds, engines, motors and all kinds of machinery. The first directors are: W. M. F. Corry, 114, Eaton Square, S.W.1 (director of Cunard Steam Ship Co., Ltd.); R. T. Johnstone, 27, Catherine Street, Westminster; R. N. Reid, 72, Gloucester Road, Hampton-on-Thames, engineer; H. M. Hopwood, 53, Marloes Road, W.8. Qualification, 1 ordinary share. Solicitors, Samuel Price, Sons and Robertson, 3, Bond Court, Walbrook, E.C. Registered office, 23, Old Queen Street, Westminster, S.W.1.

Official Returns of Electrical Companies.

Highfield Electrical Co., Ltd.—Debenture charged on deeds and documents relating to premises in Holbrooks Lane, Coventry, and the company's undertaking and property, present and future, including uncalled capital, dated December 22nd, 1926, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd.

London Power Co., Ltd.—Trust deed dated November 19th (supplemental to trust deed dated April 15th, 1926), to secure £7,000,000 debenture stock, inclusive of £3,000,000 debenture stock secured by the original deed already registered, charged on the assets and revenues of the company, present and future. Trustees: Law Debenture Corporation, Ltd., Gresham House, Old Broad Street, E.C.

Cleartron Radio, Ltd.—J. H. Stephens, 6, Clements Lane, E.C., C.A., was appointed receiver on December 28th, under powers contained in debenture dated October 25th, 1926.

K.H.E. Ignition Co., Ltd.—P. W. Ardran, of 41, Castle Street, Liverpool (acting on behalf of the late A. A. Whittingham Jones) ceased to act as a receiver or manager on November 25th, 1926.

Charles Fitz-Hugh, Ltd.—H. Brown, of 71, Temple Row, Birmingham, ceased to act as receiver or manager on December 30th, 1926.

Ackroyd & Best, Ltd.—Mortgage on various properties at Morley, dated December 13th, 1926, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

British Di-Electric Co., Ltd.—Issue on December 4th, of £200, on December 18th, of £250, and on December 22nd, 1926, of £50 debentures, parts of a series already registered.

Teignmouth Electric Lighting Co., Ltd.—Satisfaction (1) to the extent of £3,500 on November 11th, 1926, of debentures dated February 19th, 1923, securing £4,000; (2) to the extent of £500 on March 13th, and to the extent of £300 on November 11th, 1926, of debentures dated March 13th, 1923, securing £800; and (3) in full on November 11th, 1926, of debenture dated April 16th, 1923, securing £100.

Thompson Manufacturing Co., Ltd.—Satisfaction in full on December 11th, 1926, of debenture dated March 12th, 1925, securing £500.

Express Cable Engineering Co., Ltd.—Particulars filed of £200 debentures authorised November 16th, 1926, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

H. E. Davis, Ltd.—W. A. J. Osborne, of Balfour House, Finsbury Pavement, E.C.2, ceased to act as receiver and manager on December 21st, 1926.

Godfrey Salmon, Ltd.—W. A. J. Osborne, of Balfour House, Finsbury Pavement, E.C.2, ceased to act as receiver on December 20th, 1926.

City Notes.

Perak River Hydro-Electric Power Co., Ltd.

A circular dealing with the progress which has been made by the company was circulated to shareholders this week. In this it was stated that the organisation for the London administration had been established, and Messrs. Topham, Jones & Railton (1926), Ltd., had been appointed contractors for the civil engineering work. This company had already sent out a party of engineers to study the dam site, and the construction work would be carried out to the designs of Messrs. Rendell, Palmer & Tritton. It was expected that the excavation of the dam site would be well in hand in the course of three or four months. In the meantime, orders had been placed in Great Britain for the electrical plant and machinery and other requirements for the generation and transmission of electricity. The site for the steam station was being selected by Capt. A. C. Sparks. That station would be capable of giving a continuous output of 6,000 kW, and to ensure continuity of supply two 6,000-kW generating sets were being installed, one of which would be held in reserve. From that station it should be possible to give a supply within 18 months to mines within reasonable distance, as well as to the town of Batu Gajah. When the hydro-electric plant was in service, the steam station would act in a stand-by or supplementary capacity. Mr. J. Ferguson, M.B.E., had been appointed general manager in Malaya, and he would settle the question of the prices to be charged to consumers when he had had an opportunity of studying local conditions. It was the belief of the board that the provision of cheap supplies of electricity would considerably extend the magnitude and the life of the tin-mining industry in the Federated Malay States. That was borne out by the interest which tin-mining companies were taking in the company's work.

Adelaide Electric Supply Co., Ltd.

The report for the year ended August 31st last shows a revenue of £670,877 gross and £374,895 net, the latter figure showing an increase of 22 per cent. over the net profit of the previous year. After meeting debenture interest, &c., a balance of £280,035 is available. The directors have transferred £80,000 to general reserve and £10,000 to dividend equalisation fund. A final dividend of 6 per cent. is being paid on the ordinary shares, making 12 per cent. for the year, as in 1924-25. A balance of £10,553 is carried forward with £8,116 from the last account. The dismantling of the Grenfell Street power station has been completed and the plant sold at scrap prices. The balance of the cost of the plant, £321,737, has been written off against general reserve, leaving the latter at £13,263. The board proposes to offer 250,000 6½ per cent. "C" preference shares of £1 each to shareholders at par.

New Issue.

Cia. de Electricidad de la Provincia de Buenos Aires, Ltd.—Last week the company offered to its shareholders one new £1 eight per cent. non-cumulative participating preference share for each preference or ordinary share held. These were part of an issue of £350,000, and they were offered to shareholders at £1 less a commission of 2s. 6d. per share payable by the Italo-Belgian Bank, London Agency.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

On January 10th an extraordinary general meeting of shareholders was held for the purpose of confirming certain alterations in the company's articles which will be necessary if the scheme of arrangement drawn up is approved by the Court. The business was purely formal, and the necessary resolution was carried unanimously.

British Columbia Electric Railway Co. Ltd.

The directors have declared the usual half-yearly dividend upon the 5 per cent. cumulative perpetual preference stock.

At an extraordinary meeting held on January 6th, the resolutions passed at the annual meeting on December 16th, increasing the capital to £5,320,000 and giving the directors further powers, were confirmed.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Telephone Co. of Pernambuco, Ltd.—100,000 ordinary shares of £1 each, fully paid, Nos. 1 to 100,000. £150,000 8 per cent. registered debentures of £100 each, Nos. 1 to 1,500.

The undermentioned securities have been ordered to be officially quoted:—

Ever-Ready Co. (Great Britain).—71,200 ordinary shares of £1 each, fully paid, Nos. 498,801 to 570,000.

Hellenic Electric Railways.—£200,000 7 per cent. sterling bonds, series "A," Nos. A1 to 1,000 (£100) and A1,001 to 1,200 (£500); and £200,000 7 per cent. (convertible) sterling bonds, series "B," Nos. B1,201 to 2,200 (£100) and B2,201 to 2,400 (£500).

Castner-Kellner Alkali Co., Ltd.

The company is paying a final dividend of 14 per cent. (making 22 per cent. for the year 1925-26) out of a net profit of £210,928.

American Loan for Italy.

The Genoa correspondent of the *Financial Times* reports that the Unione Esercizi Elettrici has arranged a $10,000,000 loan in New York.

Edmundson's Electricity Corporation, Ltd.

An interim dividend of 3 per cent. has been declared on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

FURTHER progress in the upward direction has taken place amongst investment stocks and shares, for the reasons noted in our first article of the New Year. These are, the Government's courage in offering new 4 per cent. Consols at the relatively high price of 85 and, secondly, the hope of money becoming cheaper. Capital in plenty is available for investment, and speculative new issues are being readily taken. Stock Exchange business is reasonably active. A revival in rubber shares followed with promptitude upon an advance in the price of raw rubber.

This last consideration weighs but little with the buyers who have come forward to take cable and electrical equipment

shares on the impression that big business is at hand. Several of the companies have published details of important contracts secured recently. The programme of electrical extension contemplated by the Southern Railway will mean, in itself, a very substantial accession of business to manufacturing companies. The Government's avowed policy of cheaper bulk electricity is expected to provide work for a year or two, at least. The re-conditioning of colliery plant, as one sequel to the conclusion of the coal stoppage, is regarded as another potent element in the electrical industry. The remarkable stimulus given to telephony by the linking of London and New York by air, is prayed in aid by those who foresee a time of profitable activity ahead, and the admission of Sir George Sutton, Henley's chairman, that conversations have taken place between some of the cable-manufacturing undertakings is another bull point.

Rises have occurred in Siemens, British Insulated, Henleys, General Electrics, Enfield Cables, Callenders, British Aluminiums, and Telephone Manufacturing. Johnson & Phillips remain somewhat dull, and Edisons have failed to rally from the decline caused by the falling-off in profits shown by the recent report. Ever Ready shares have come to life again, the ordinary spurting to 79s., on expectations of another bumper profit being recorded when the accounts come out in April next. The preference shares look reasonably-valued at 28s. 6d.: entitled to 7 per cent. dividend, they participate up to 10 per cent., and are receiving the latter rate, which gives a yield of 7 per cent. on the money, at the price just quoted.

Metropolitans and Districts have rallied after a drop of ½ apiece, and Underground £1 shares are better at 13s., and Central London Assented ordinary strengthened to 70. A feature in the Home Railway market is the ready absorption of the pre-ordinary stocks. A number of debenture and guaranteed stocks, and a few preferences are almost impossible to buy.

County of London Electric ordinary gained 1s. 6d. to 27s. 6d., upon the circulation of a tip to buy the shares. The dividend is due for declaration next month. No other changes have occurred in the list of London electricity supply issues. City of Londons are the only shares in the group not yet quoted ex rights. The increases which are now added to the previous ordinary share capitals of the London companies, as from January 1st this year, can be usefully set out in a table, as follows:—

COMPANY.	Ordinary share capital at 31st Dec., 1925.	Amount of capitalised reserves.	Bonus proportions.	Present ordinary share capital, including capitalised reserves.
Brompton & Kensington ...	£292,330	£58,466	20% (1 for 5)	£350,796
Charing Cross	£576,000	£460,800	80% (4 for 5)	£1,036,800
Chelsea	£247,180	£148,308	60% (3 for 5)	£395,488
City of London	£800,000	£400,000	50% (1 for 2)	£1,200,000
County of London	£1,330,000	£1,77 ,834	133⅓% (4 for 3)	£3,103,834
Kensington & Knightsbridge	£105,000	£189,0 0	180% (9 for 5)	£294,000
London	£499,500	£199,800	40% (4 for 5)	£699,300
Metropolitan	£1,000,000	£500,000	50% (1 for 2)	£1,500,000
St. James' & Pall Mall ...	£400, 00	£240,000	20% (1 for 5)	£640,000
South London	£260,000	£234,000	90% (9 for 10)	£494,000
South Metropolitan ...	£250,000	£350,000	140% (7 for 5)	£60 ,000
Westminster	£755,620	£5.3.746	66⅔% (2 for 3)	£1,259,366

The Notting Hill Company has still to announce the amount of free reserves available for capitalisation.

United River Plate Telephones are 10s. better at 8⅞. It is contended that the price has been under-valued of late, and that the rise of the past fortnight is no more than a recognition of the shares' previous cheapness. There are, also, vague rumours as to the possibility of a bonus of some kind. Automatic Telephones are better at 55s., and so are International Automatic "B" at 2¼, while American Telephone and Telegraph capital stock has gone up sharply in New York by reason of the inter-continental telephone service. The prices of cable stocks and shares are unaffected by this new departure. Globe ordinary are even 5s. higher. From this steadiness, it seems reasonable to conclude that cable stockholders have become shock-proof against wireless competition. Marconis are quiet at 13s. 9d., and Canadians at 3s. 4½d. It is officially stated that the long-expected Marconi report will be out by the end of this month. Telephone of Pernambuco shares are attracting a little speculative attention at 12s. 6d.

Brazilian Tractions fell back to 107 before recovering to 110. The Mexican Utilities show irregular movements. Mexican Electric Light fives are lower at 58, and Mexican Light and Power seconds at 86½, although the common shares of the latter have hardened to 32½. British Columbia Electric Railway stocks are buoyant, the preferred and deferred both gaining 3 points. The Anglo-Argentine Tramways trio is somewhat better. Amongst the home industrials, Babcocks are a good market at 53s. 9d., and a disposition to buy low-priced iron and steel shares is evidence of a public willingness to speculate in this section.

Share List of Electrical Companies.

	Nom.	Dividend. 1924.	Dividend. 1925.	Price Jan. 10 1927.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£ 1	14	14	60/6	—	4 12
Brompton Ordinary	1	10	10	25/-	—	5 12 0
Charing Cross Ordinary	1	15	15	25/-	—	5 19 0
do. do. 4½ Pref. ...	1	4½	4½	17/6	—	5 3 10
Chelsea	1	12	12	25/-	—	5 12 0
City of London	1	15	15	2½	—	... ...
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/-	—	5 14 4
County of London	1	15	15	27/6	+1/6	... ...
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	26/9	—	5 19 8
do. 7% Pref.	1	6	7	23/-	—	6 1 9
Elec. Supply Corporation	1	10	10	30/6	—	6 11 9
Kensington Ordinary	1	15	15	24/-	—	5 16 8
Lancs. Light and Power	1	7½	7½	24/-	—	6 2 6
London Electric	1	10	10	24/-	—	5 17 6
do. do. 6% Pref.	6	6	6	6¾	—	5 11 7
Metropolitan	1	11	11	26/-	—	5 7 8
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	21/-	—	5 14 3
Newcastle-on-Tyne Ordinary ...	1	7	7	21/3	—	6 11 9
do. 5% Pref. ...	1	5	5	17/6	+6d.	5 14 3
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	24/-	—	5 16 8
South London	1	15	15	24/6	—	6 8 0
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	4	7	1/3	—	5 17 11
do. 6% Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	15	24/6	—	5 14 3
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	30/3	—	7 8 2
Yorkshire Elec.	1	8	8	27/-	—	5 18 6
HOME RAILS.						
Central London Ord. Assented ...	Stock	4	4	70	+1	5 14 4
Metropolitan	,,	5	5	64½	—	7 16 4
do. District	,,	3½	3½	58	—	6 1 9
Underground Electric	£1	Nil	Nil	13/-	+6d.	Nil
do. do. Income ...	Bonds	6	6	103	—	*5 17 8
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	101	—	5 18 10
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	8	10	2¾	+1/8	8 12 9
Chili Telephone	5	5	6	6¾	—	4 7 4
Cuba Sub. Ord.	10	5	5	7	—	7 5 6
Eastern Extension	10	10	10	17½	—	*5 11 4
Eastern Tel. Ord.	Stock	10	10	177½	—	*5 12 1
Globe Tel. and T. Ord.	10	10	10	18¾	+¼	*5 6 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	26¾	—	7 9 6
Indo-European	25	8½	10	47½	—	*5 5 10
Marconi	1	10	Nil	¼	—	... ...
Marconi-Marine	1	10	7½	1¼	—	6 13 4
Oriental Telephone Ord.	1	12	12	2 7/8	—	*4 18 4
United R. Plate Tel.	5	8	8	8/-	+⅛	*4 15 6
Western Telegraph	10	10	10	17½	—	*5 16 0
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	2¾	—	9 11 4
do. do. 2nd Pref. ...	5	6	6	2¾	+1/8	10 8 8
do. do. 5% Deb. ...	Stock	5	5	67½	+1/-	7 8 2
British Electric Traction Ord. ...	,,	7	8	144½	—	5 10 9
do. do. 6% Pref. ...	,,	6	6	109	—	5 10 1
Brazil Traction	100	4	5	110	+1½	4 11 0
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	89½	+1	5 11 9
do. do. Preferred ...	,,	9/-	136/9	120½	+3	*5 3 11
do. do. Deferred ...	,,	129/5	8	149½	+3	*5 7 0
do. do. Deb. ...	,,	4½	4½	79½	—	5 8 8
London & Sub. Trac. 5% Pref. ...	1	2½	Nil	7/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	64½	+1	7 15 0
Mexican Light Common	100	Nil	Nil	32½	+1	Nil
do. Pref.	100	Nil	Nil	76½	—	Nil
do. 1st Bonds	—	5	5	63½	−1	7 17 6
Yorkshire (West Riding)	1	5	—	12/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	13	53/9	+1/8	4 16 8
British Aluminium Ord.	1	5	10	49/6	+1/6	4 1 6
British Elec. Transformer Pref. ...	1	Nil	7	18/3	—	7 13 5
British Insulated Ord.	1	15	15	70/-	+½	4 5 9
Brush Ord.	1	10	10	26/3	—	7 12 4
Callenders	1	15	15	3½	+⅛	4 5 9
do. 6½% Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	31/3	—	6 8 0
Enfield Cable Pref.	1	7½	7½	1½	—	6 6 4
English Electric	1	5	Nil	12/-	—	... ...
do. do. Pref.	1	6	6	17/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	+1/-	5 10 8
do. Ord.	1	5	7½	31/6	+6d.	4 15 3
Henley	1	18	20	6½xd	+⅛	4 12 10
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1 1/8	—	*4 14 1
Johnson & Phillips	1	10	17½	2 1/4	—	5 19 1
Met.-Vickers Ord.	1	8	8	26/3	—	6 2 0
do. Pref.	3	6	6	2 1/4	—	6 13 4
Siemens Ord.	1	7½	7½	1 5/8	+⅛	4 16 9
Telegraph Construction	12	20	10	23½	—	*4 1 4

*Dividends paid free of Income Tax.

Minor African Markets.

Electrical Import Figures of Nigeria, the Gold Coast, Kenya and Uganda, and Tanganyika.

THERE are now markets for electrical goods in the Gold Coast, Nigeria, and Sierra Leone on the West Coast of Africa, and in Kenya, Uganda, and Tanganyika on the East Coast, that are well worth consideration. It will be seen from the following statistics, which are compiled from official sources, that there were healthy increases in the imports of electrical machinery and apparatus and telegraph material into Nigeria in 1925, compared with 1924. Imports of similar goods in those years are also given below for the markets mentioned, together with notes of increases or decreases.

Imports into Nigeria.

	1924. £	1925. £	Inc. or dec. £
Machinery, electrical—			
Total	3,600	19,600	+16,000
From United Kingdom	2,000	5,700	+ 3,700
,, U.K. Government	1,300	12,000	+10,700
,, United States	140	50	– 90
,, Germany	120	1,900	+ 1,780
Electrical and telegraphic apparatus—			
Total	30,000	32,500	+ 2,500
From United Kingdom	5,500	3,500	– 2,000
,, U.K. Government	23,700	28,000	+ 4,300
,, Germany	80	800	+ 720

Imports into the Gold Coast.

	1924. £	1925. £	Inc. or dec. £
Electrical and telegraphic apparatus—			
Total	49,000	36,000	–13,000
From United Kingdom	3,800	6,600	+ 2,800
,, U.K. Government	44,000	29,000	–15,000
,, Germany	200	200	—
,, United States	520	340	– 180
Electrical machinery—			
Total	31,000	22,000	– 9,000
From United Kingdom	4,000	11,500	+ 7,500
,, U.K. Government	26,000	9,800	–16,200
,, Germany	100	250	+ 150
,, United States	500	250	– 250

Imports into Sierra Leone.

	1924. £	1925. £	Inc. or dec. £
Electrical and telegraphic apparatus—			
Total	31,000	16,000	–15,000
From United Kingdom	29,000	13,000	–16,000
,, U.K. Government	2,000	3,000	+ 1,000
Machinery, electrical—			
Total (all U.K. Government)	790	—	– 790
Machinery, industrial—			
Total	270	1,200	+ 930
From United Kingdom	230	930	+ 700
,, U.K. Government	10	125	+ 115

Imports into Kenya and Uganda.

	1924. £	1925. £	Inc. or dec. £
Electric wires and cables, insulated—			
Total	1,000	8,400	+ 7,400
From Great Britain	900	8,200	+ 7,300
,, Germany	35	80	+ 45
Ditto on Government account*	1,600	—	– 1,600
Electric wires and cables, uninsulated—			
Total *	5,800	2,200	– 3,600
Electrical goods and apparatus, n.e.s.—			
Total	22,000	20,500	– 1,500
From Great Britain	20,700	17,700	– 3,000
,, Germany	300	1,900	+ 1,600
,, United States	430	500	+ 70
Ditto on Government account*	7,400	6,000	– 1,400
Telegraph and telephone instruments and apparatus—			
Total	350	900	+ 550
From Great Britain	350	800	+ 450
Ditto on Government account*	7,000	12,000	+ 5,000
Electrical machinery and parts—	1924. £	1925. £	Inc. or dec. £
Total	19,250	27,500	+ 8,250
From Great Britain	17,500	21,000	+ 3,500
,, Belgium	—	2,300	+ 2,300
,, Sweden	50	1,400	+ 1,350
,, United States	1,000	2,000	+ 1,000
Ditto on Government account*	—	3,500	+ 3,500
Engines, steam—			
Total	27,000	36,600	+ 9,600
From Great Britain	26,000	32,000	+ 6,000
,, United States	1,000	—	– 1,000
,, Germany	—	4,000	+ 4,000
Ditto on Government account*	—	3,000	+ 3,000

* All from Great Britain.

Imports into Tanganyika.

	1924. £	1925. £	Inc. or dec. £
Wires and cables, insulated—			
Total	560	860	+ 300
From United Kingdom	370	660	+ 290
,, Germany	10	180	+ 170
Electrical goods and apparatus, n.e.s.—			
Total	5,200	3,300	– 1,900
From United Kingdom	3,800	2,400	– 1,400
,, Germany	50	500	+ 450
Telegraph and telephone instruments and apparatus—			
Total	3,800	8,400	+ 4,600
From United Kingdom	3,600	8,300	+ 4,700
Electrical machinery—			
Total	200	190	– 10
(Mainly from Germany in 1925.)			
Steam engines—			
Total	4,000	10,600	+ 6,600
From United Kingdom	1,200	4,800	+ 3,600
,, Germany	550	4,200	+ 3,650
Lamps and lanterns—			
Total	7,800	10,300	+ 2,500
From United Kingdom	740	1,400	+ 660
,, United States	900	2,200	+ 1,300
,, Germany	2,000	4,800	+ 2,800

Lighting Business in Portugal.

A foreign official report states that the bulk of the table and floor electric light standards, pendants, &c., used in Portugal are imported. Local manufacture of such goods is not well developed, and is therefore not in a position to compete strongly. At Lisbon and Oporto there are about a dozen firms manufacturing such goods, but their products are mainly of cast iron, copper and bronze. Everything else required is imported. Glass lustres come from Czecho-Slovakia and Germany, alabaster bowls from Italy, and pendants and standards in wrought iron, copper, and bronze from Italy and France. French exporters find it a difficult matter to obtain much of the business owing to the relatively high prices of their products. The Portuguese buyer exhibits a preference for the highly decorative type of fitting, and there has been a very large sale of coloured glass and alabaster bowls, which are used in all the larger shops and dwelling houses. Payment is usually made by importing houses at 30 days with discount, or 60 or 90 days net, from the arrival of the goods. Where the customer is known to be financially sound, documents should be sent through a bank to be exchanged for acceptance. It is not advisable to send small goods by parcel post, as the service is very slow, and as much as three months' time may be occupied in the journey. Particular attention should be paid to packing, and very strong cases should be used.

The Physical Society's Exhibition.

Annual Display of Electrical Instruments and Scientific Apparatus.

(*Continued from page* 33.)

Cambridge Instrument Co., Ltd.

A new recorder for measuring the percentage of dissolved oxygen in boiler feed-water was shown working. An outfit has been on test in the Deptford power station of the London Electric Supply Corporation, Ltd., for some months, and has aroused considerable interest. Illustrated in fig. 5, the outfit is a robust boiler-house instrument, which records the percentage of oxygen on a chart calibrated in cubic centimetres per litre of water, and thus enables defects in the feed-water system to be instantly detected; the full-scale deflection corresponds to one cubic centimetre of oxygen per litre, and the apparatus may be arranged to operate an electric alarm. The principle upon which it works is as follows:—Water from the boiler feed system is passed at a constant rate through a tower filled with extractor rings, where it is "scrubbed" by a constant flow of pure hydrogen generated electrolytically. The hydrogen mechanically displaces the dissolved oxygen in the feed water, and the relative rates of flow of hydrogen and water are so arranged that the displaced gas forms a considerable percentage of the total gas issuing from the top of the scrubber; this percentage is measured by a katharometer, and is shown on the chart of the recorder. The katharometer contains two identical spirals of platinum wire, enclosed in separate cells in a metal block, forming two arms of a Wheatstone bridge; when an electric current flows in the circuit, the spirals become heated and lose heat to the walls of the cells, their temperatures (resistance) depending on the thermal conductivity of the gases surrounding them. One of the cells is exposed to the pure hydrogen passing from the electrolytic supply, the other to the gas after passing through the scrubber tower. Owing to the presence of the oxygen from the feed water, the thermal conductivity of the gas in the second cell is different from that of the first, and the Wheatstone bridge circuit is thrown out of balance, causing a deflection of the galvanometer, the extent of which is an indication of the amount of oxygen present in the second cell. Fig. 6 is a diagrammatic arrangement of the complete outfit. The feed water is led through a needle valve and inlet cock A into B, arranged to keep the water supply constant, without exposure to the air, by the overflow C. The flow through the scrubber is regulated by the cock D to about 500 cc. per minute. The hydrogen is generated in M by about 1.4 amperes, and passes across one cell L_1 of the katharometer K, and then through the tube J to the bottom of the scrubber tower F. On leaving the top of the scrubber it passes across the second cell L_2 and out to the air. The katharometer is connected by 4-way leads to the recorder shown on the left in fig. 5; it is a standard thread recorder, may be placed a considerable distance away, is entirely clock driven, and consists of a moving-coil galvanometer, the pointer of which is automatically depressed once a minute on to an inked thread, which it presses into contact with a moving chart.

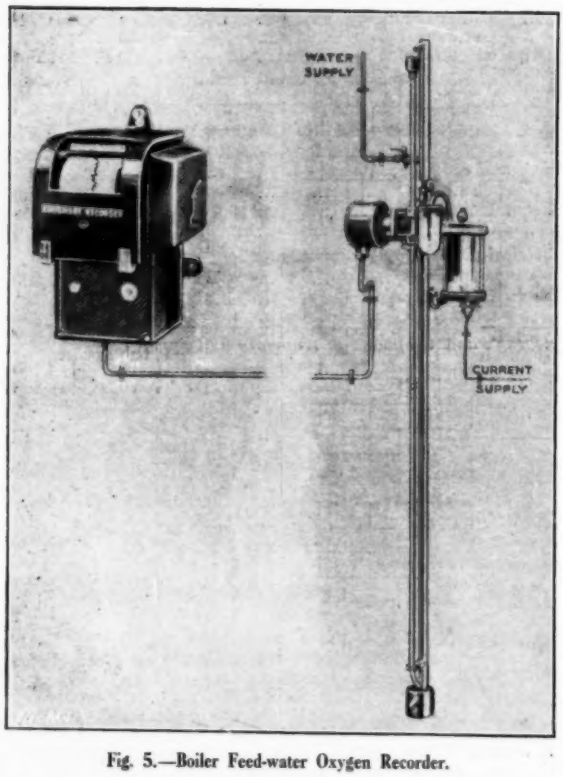


Fig. 5.—Boiler Feed-water Oxygen Recorder.

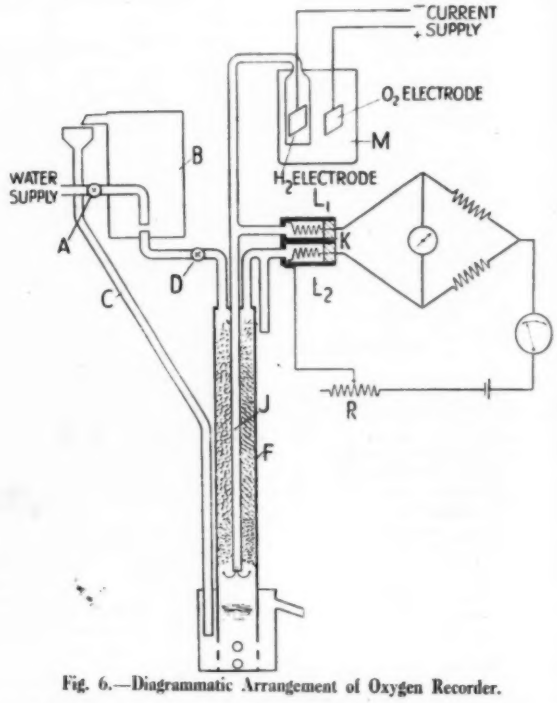


Fig. 6.—Diagrammatic Arrangement of Oxygen Recorder.

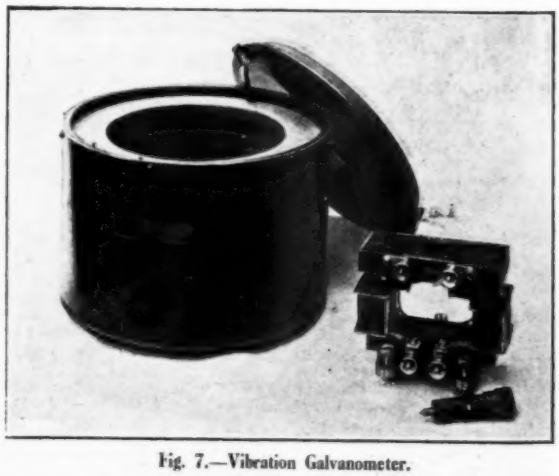


Fig. 7.—Vibration Galvanometer.

A compact outfit was shown for determining the hydrogen-ion

concentration of solutions by the glass-electrode method developed by Mrs. P. M. Tookey-Kerridge, of the Department of Physiology and Biochemistry, University College, London. A thin glass membrane separates the solution whose concentration is to be determined from a buffer solution of known pH, and the difference of electrical potential between the solutions is measured by means of a direct-reading potentiometer, a Lindemann electrometer being used as a null-point indicator in the electrode circuit. The glass electrode enables the pH value of small quantities (0.5 cc. or less) of liquids (clean, coloured, or turbid) easily reducible or unstable in air, and of semi-solids (such as minced tissues) to be rapidly and accurately measured, without the serious technical difficulties which have previously been associated with these measurements.

A vibration galvanometer exhibited (fig. 7), of the type originally evolved by Schering & Schmidt, and manufactured by the Cambridge Co. in accordance with designs furnished by the National Physical Laboratory, is particularly suitable for use in conjunction with the Schering bridge method of measuring power losses in dielectrics and for precision measurements on standard condensers. The instrument is tuned by varying a small d.c. polarising current which can be supplied by two or three small accumulators; if required, the instrument, battery, and adjusting resistance can be at a high potential above earth, the resistances being operated by an insulating handle. Since the alternating-current circuit of the galvanometer is fixed, and is not limited as to size and inertia, as it is in the case of a moving-coil vibration galvanometer, a large number of turns of fine wire may be used, which is an advantage when measurements on circuits of high impedance are to be made. The galvanometer can be used for frequencies between 25 and 120 periods per second, and consists of a small U-shaped magnet, made up of three pieces for providing the polarising field, and two other magnets, the pole tips of which are made to form radial arms about the vibrating system; the polarising flux passes through the two latter magnets. The polarising winding is wound on the two main limbs of the uprights, forming the arms of the "U" magnet, and the measuring windings, which consist of four small bobbins, are mounted, one each, on the limbs of the two small magnets. An alternating current flowing in the latter distorts the field by moving it through an angle, first in one direction and then in the other on either side of the neutral position. The vibrating system consists of a small piece of thin soft iron, suspended by a light phosphor-bronze strip which is anchored at both extremities and carries a plane mirror. The vibrating system is contained in a metal case, in which is fitted a lens of about one metre focal length, and a beam of light focused on to the needle mirror is reflected on to a ground-glass plate with graduated divisions. Provision is made whereby the earth capacity of the instrument is reduced to a low figure, and the galvanometer is protected from magnetic fields by means of a heavily-laminated shield.

Foster Instrument Co.

An example of automatic temperature-control apparatus (general particulars of which recently appeared in our pages)

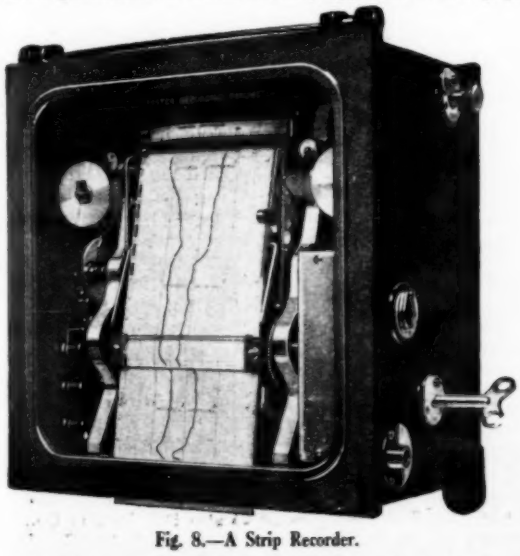


Fig. 8.—A Strip Recorder.

was exhibited: points worthy of notice are the following:—The actual mechanism for making the primary contacts inside the case of the pyrometer indicator is necessarily delicate, compared with the other parts of the apparatus. In order that these delicate parts shall not be subject to undue forces by misuse, or interference with other parts of the apparatus, they are so arranged that only a limited force, due to gravity, can be applied to the contacts. The motor-driven mechanism for producing these contacts is made heavy and capable of running continuously for many years, but its action on the delicate parts is only in a permissive sense; that is to say, it only permits the force of gravity to act inside the indicator. No adjustment, or maladjustment, by the user can put any extra force upon those parts.

The cylinder temperature pyrometer enables measurement to be made of the mean gas temperature inside the cylinder of an internal-combustion engine. Hitherto the chief difficulty of obtaining this information has been to provide facility for inserting a thermo-couple into the cylinder in such a position that it would attain the temperature of the gases. In the Foster instrument an ignition plug, while performing its normal function, serves also as a thermo-couple, its junction being at the tip of the centre electrode of the plug. The latest development of the strip recorder (illustrated in fig. 8) is also shown, in which six records of distinguishable colours are produced on one chart from six different thermo-couples.

Elliott Brothers (London), Ltd.

A sample of the many instruments on this company's stand is illustrated in fig. 9, being a portable frequency indicator of convenient pattern. A piece of apparatus which has not been exhibited before is shown in fig. 10; it is a new form of portable galvanometer made up in a metal case, and has a knife-edge pointer, anti-parallax mirror, and evenly-divided

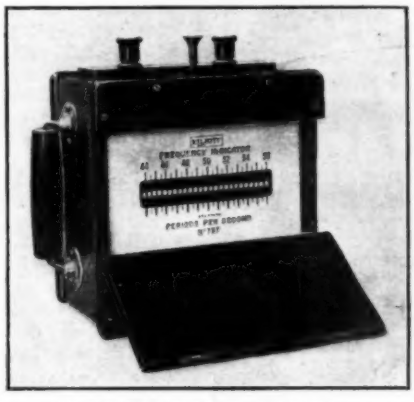


Fig. 9.—Portable Frequency Indicator.

Fig. 10.—A Portable Galvanometer.

scale. It is of the moving-coil pattern, and can be used as a milliammeter, galvanometer, and micro-ammeter, its standard sensitivities being as follows:—

Scale length ...	80 m/m	80 m/m
Coil resistance	300 ohms.	50 ohms.
As a galvanometer:—		
Sensitivity ...	$0{\cdot}25 \times 10^{-6}$ amp. per div.	$1{\cdot}0 \times 10^{-6}$ amp. per div.
Scale (m/m divs.)	40—0—40 m/m	40—0—40 m/m
Periodic time	3 secs.	3 secs.
As a microammeter:—		
Range	0—10 and up.	0—100 and up.
Damping ...	Partially damped.	Partially damped.
Time to rest ...	3 secs.	3¼ secs.

Other devices which have recently been placed on the market are mentioned below, namely, a live-cable core temperature indicator (Fawssetts patent) which gives the core temperature of any cable, either low-tension or e.h.p., under working conditions. It consists of a combination of thermo-couples with millivoltmeter so arranged that the reading of the instrument gives directly the temperature of the core of the cable. It can be employed for indicating the temperature of cables working at any voltage. An averaging recorder for bulk power supplies gives the total consumption, and also the maximum demand averaged over a definite time interval. It can be calibrated as a kVA meter if desired. The particular sample shown was a 3-phase, 3-wire recording wattmeter for unbalanced or balanced loads. A pressure indicator consists of an electrically-operated valve and step-by-step contact mechanism, whereby pressure curves, such as are obtained in explosion engines, &c., may be plotted to any scale desired. The apparatus may be used to obtain, say, the pressure variation in the "scavenging" stroke of a Diesel engine, and also the "explosion" stroke. The curves are plotted in a manner similar to the wave-form curves of an alternator. The valve is pressure-tight against pressures of 1,500 lb. to the square inch; and the apparatus is suitable for speeds up to about 250 r.p.m.; by suitable modification speeds up to 500 r.p.m. can be dealt with.

(To be continued.)

The British Industries Fair.

Lists of Birmingham and London Exhibitors.

WE are now in a position to publish complete lists of exhibitors at this year's British Industries Fair whose goods are of interest to our readers. The London Section catalogue has actually been produced, although the Fair does not open until February 21st; it is a substantial volume, containing particulars relating to over 900 exhibitors, and the goods are very well classified and indexed. The Birmingham exhibits, which are generally on a larger scale than those at the White City, number over 500.

One feature of this year's Fair is the endeavour which British manufacturers have made to conform to overseas customers' requirements. Many of them took advantage of the slack months of 1926 to make a study of Dominion and foreign markets with a view to gauging their needs. As a result, first-hand information of a valuable nature has been obtained, suggesting new methods of production and design to meet special requirements. The organisers of the Birmingham Fair (the Birmingham Chamber of Commerce) have prepared a list giving a number of lines in which British manufacturers are making a definite challenge to foreign competitors. The list includes electric washing machines, electrical accessories, household appliances, water heaters, motors, electric vehicles, vacuum cleaners, power pumps, elevators and trucks, electric drills, welding machines, and flexible cords and cables. The following are the names of companies, firms and individuals who are taking part in the Fair:—

Birmingham.

Accles & Pollock, Ltd.
Allen-Liversidge, Ltd.
Allen, W. H., Sons & Co., Ltd.
Antrobus & Co.
Avery, W. & T., Ltd.
Barrett, Wakefield & Co., Ltd.
Batteries, Ltd.
Beatty Bros., Ltd.
Belliss & Morcom, Ltd.
Berry's Electric, Ltd.
Birkbys, Ltd.
Birmingham Electric Supply Dept.
Blackstone & Co., Ltd.
Britannia Tube Co., Ltd.
British Electrical Repairs, Ltd.
British Electric Transformer Co., Ltd.
British Thomson-Houston Co., Ltd.
British Vacuum Cleaner and Engineering Co., Ltd.
Brook, E., Ltd.
Bulpitt & Sons, Ltd.
Callender's Cable and Construction Co., Ltd.
Calvete, I., Ltd.
Cambridge Instrument Co., Ltd.
Canning, W., & Co., Ltd.
Carron Company
Castle Fuse and Engineering Co., Ltd.
Chloride Electrical Storage Co., Ltd.
Clayton & Shuttleworth, Ltd.
Cleworth, A. B., & Co., Ltd.
Coventry Electrical Accessories, Ltd.
Credenda Conduits Co., Ltd.
Crossley Bros., Ltd.
Damard Lacquer Co., Ltd.
Daulby, S. J.
Davidson & Co., Ltd.
Davis & Timmins, Ltd.
De la Rue, Thos., & Co., Ltd.
Dundee Electrical Repairs Co., Ltd.
Eastern Telegraph Co., Ltd.
Ebonestos Insulators, Ltd.
Electric Fires, Ltd.
Electric Heating and Hardware, Ltd.
Electric Transmission, Ltd.
Electrical Power Engineers' Association.
Electrical Power Engineering Co. (Birmingham), Ltd.
Electricars, Ltd.
Electroflo Meter Co., Ltd.
Ellison, George
Excelsior Shade Mfg. Co.
Falkirk Iron Co., Ltd.
Fielding & Platt, Ltd.
Gardner, L., & Sons, Ltd.
General Electric Co., Ltd.
Gent & Co., Ltd.
Gledhill Brook Time Recorder, Ltd.
Hackbridge Electric Construction Co., Ltd.
Harcourts, Ltd.
Harper, J., & Co., Ltd.
Hart Accumulator Co., Ltd.
Heenan & Froude, Ltd.
Hewittic Electric Co., Ltd.
Holden & Hunt.
Hunt & Mitton, Ltd.
Hunt, J. A. H.
Imperial Engineering Co.
Jackson Electric Stove Co., Ltd.
Johnson, Rd., Clapham and Morris, Ltd.
Kelvin, Bottomley & Baird, Ltd.
Kent, George, Ltd.
Kenyon, W., & Co., Ltd.
K.F.M. Engineering Co., Ltd.
Lister, R. A., & Co., Ltd.
London Electric Wire Co. and Smiths, Ltd.
Macintosh Cable Co., Ltd.
McGeoch, Wm., & Co., Ltd.
Manda Motors, Ltd.
Mawdsley's, Ltd.
May & Padmore, Ltd.
Mersey Cable Works, Ltd.
Metropolitan-Vickers Electrical Co., Ltd.
Midland Fan Co., Ltd.
Millington, E. H., & Co., Ltd.
M.L. Magneto Syndicate, Ltd.
Morton, A., Ltd.
Mouldensite, Ltd.
National Gas Engine Co., Ltd.
New Conveyor Co., Ltd.
Nobbs, Geo., Ltd.
Pantin, W. & C.
Parker, Winder & Achurch, Ltd.

Birmingham—*continued.*

Park Royal Engineering Co., Ltd.
Parsons, C. H., Ltd.
"Petosign" Co.
Porcelain Electric Fittings Association.
Premier Electric Heaters, Ltd.
Pritchett & Gold & E.P.S. Co., Ltd.
Rainsford & Lynes, Ltd.
Rapid Magnetting Machine Co., Ltd.
Rawlplug Co., Ltd.
Record Electrical Co., Ltd.
Rees Roturbo Mfg. Co., Ltd.
Reyrolle, A., & Co., Ltd.
Rudd, E., & Co.
Runbaken Magneto Co.
Ruston & Hornsby, Ltd.
Santon, Ltd.
Shropshire, &c., Electric Power Co.
Small, W. R.
Spauldings, Ltd.
Steam Gauge Mfg. Co.
Stewarts & Lloyds, Ltd.
Stone, J. B., & Co., Ltd.
Sturge & Baker, Ltd.
Tangyes, Ltd.
Telegraph Construction and Maintenance Co., Ltd.
Timpany & Tylor.
Tucker, J. H., & Co., Ltd.
T.V.E., Ltd.
Underfeed Stoker Co., Ltd.
Vickers-Petters, Ltd.
Ward & Goldstone, Ltd.
Westminster Tool & Electric Co.
Wiggin, Henry, & Co., Ltd.
Wilkins & Wright, Ltd.
Wingrove & Rogers, Ltd.
Wolseley Sheep Shearing Machine Co., Ltd.
Yorkshire Switchgear and Engineering Co., Ltd.

London.

Artistic Shade Co.
Ashton, H.
"Attracta" Electrical Co.
Beard & Fitch, Ltd.
Beetle Products Co., Ltd.
Bird, Sydney S., & Sons.
Birkbys, Ltd.
Bourne, Joseph, & Son, Ltd.
Brilliant Sign Co. (1907), Ltd.
Britain's Best Crystal, Ltd.
British Electrical Sales Organisation.
British General Mfg. Co., Ltd.
Brown, S. G., Ltd.
Brownie Wireless Co. of Gt. Britain, Ltd.
Calvete, I., Ltd.
Camden Engineering Co., Ltd.
Cooke, Troughton & Sims, Ltd.
Crystalate Mfg. Co., Ltd.
Dent, R. H.
Dowsing Radiant Heat Co
Eastick, J. J., & Sons.
Electrolux, Ltd.
Ever-Ready Co. (Gt. Britain), Ltd.
Formo Co. (A. Preen & Co.)
Graham, R. F., & Co.
Gramostyles, Ltd.
Grover & Co., Ltd.
Halcyon Wireless Supply Co., Ltd.
Hart Accumulator Co., Ltd.
Hinderlich, A.
J. M. O., Ltd.
Lissen, Ltd.
London Radio Mfg. Co., Ltd.
Marathon, Ltd.
New London Electron Works, Ltd.
Portable Utilities Co., Ltd.
Priory Loud Speaker Co.
Radiocoil Electro-Magnetic Blanket Co., Ltd.
Read Radio, Ltd.
Ross, Ltd.
See, J. W., & Sons.
Smith, S., & Sons (Motor Accessories), Ltd.
Stratton & Co., Ltd.
Synchronome Co., Ltd.
Technical Agencies Co.
Telegraph Condenser Co., Ltd.
Truphonic Wireless Co.
Tungstone Accumulator Co., Ltd.
Turner, Ernest.
Universal Cabinets, Ltd.
Vulco Dry Battery Co., Ltd.
Watmel Wireless Co., Ltd.
Western Laboratories, Ltd.
Whittingham, Smith & Co.
Wolff, M. & A. (Etherplus).

New Electrical Devices, Fittings and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Outdoor Circuit Breaker.

We have received some particulars of a new ("K") type of oil circuit breaker which has been introduced by MESSRS. JOHNSON & PHILLIPS, LTD., Charlton, London, S.E.7. It is designed for outdoor working on 15,000 V, and is claimed to be completely weatherproof and constructed so as to prevent the ingress of rain, sleet or snow. The operating mechanism embodies the loose-handle feature, so that it is impossible to hold the breaker closed under heavy-overload or short-circuit conditions. It is constructed about a cast-iron base plate and surmounted by a sheet-steel cover. The apparatus is designed for chain operation, but if desired an alternative method can be supplied in the form of an operating lever. The tripping of the breaker is effected by operating the chains in the reverse direction; once the opening operation has been started the mechanism releases the switch, which then opens automatically at high speed. The contacts are of the double-break pattern, suitable for 200-A loading. For automatic operation series trip coils are mounted beneath the oil level. A delay action is obtained on the trip coils by means of a small oil dashpot which prevents the breaker from being opened unnecessarily by sudden kicks on the line. The h.p. leads are brought out from the fixed contacts through the top plate and thence through porcelain bushes to the exterior. Standard 2-ft. cable tails are provided. The insulation is of porcelain and bakelite material throughout. The oil tank is built up of welded sheet-steel, provided with strengthening straps, and is fitted with lifting handles and a filling plug and drain cock. Special precautions have been taken to prevent damage due to rust and corrosion; all the working parts are of non-ferrous metal, stainless steel, or treated with a special non-rusting process which permeates the metal. The weight of the switch, including the fixing straps, is approximately 420 lb., and 14 gallons of oil are required for the first filling of the oil tank. A suitable disk "on" and "off" indicator is provided. Fig. 1 shows the switch with the tank lowered and the lid cover removed.

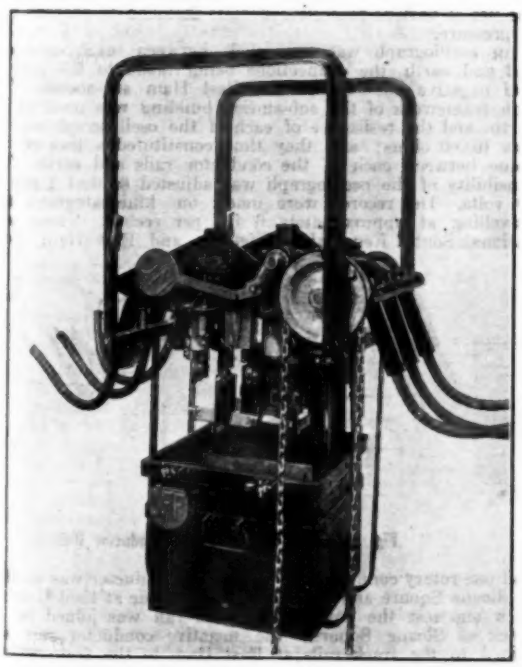


Fig. 1.—Outdoor Circuit Breaker.

A Light Shielding Fitting.

For providing sufficient illumination for theatre aisles and at the same time shielding the light so that it is not objectionable to the spectators or performers, is the purpose of the LA series of aisle light condulets, fig. 2, which are being marketed by the CROUSE-HINDS COMPANY, Syracuse, New York. These fittings, some particulars of which are given in *Electrical Merchandising*, are very narrow, and when installed at the end of a row of seats do not obstruct the aisle. The front of the condulet is easily removed, facilitating the renewal of lamps. No glass is used. If desired, coloured lamps can be used.

Fig. 2.—Theatre-Aisle Fitting.

Fig. 3.—Electric Floor Machine.

A Heavy-Duty Floor Machine.

A new floor machine for heavy work, described in *Electrical Merchandising*, has been introduced by the FAY COMPANY, 11, East 31st Street, New York. The machine, "Jumbo," fig. 3, is of the rotary type, weighs 125 lb., and is equipped with a ½-h.p. motor. The diameter of the base is 15½ in. The attachments provided for the machine are 14 in. in diameter, and include a bassine fibre scrubbing brush for scrubbing, such as wood, linoleum, rubber and composition floors; a steel-wire brush for scrubbing concrete, marble, and very dirty floors; a bassine fibre waxing brush for rubbing wax into wood, linoleum, &c.; a tampico polishing bush; a steel wire brush; and a sandpaper disk which is used for sanding floors.

An Electric Cable Vehicle.

A specially designed electric vehicle for transporting drums of cable has recently been introduced by Messrs. WINGROVE AND ROGERS, LTD., Mill Lane, Liverpool. It comprises a B.E.V. electric truck fitted with special lifting and conveying gear suitable for dealing with drums weighing up to 6 tons. The truck is so constructed that the chest containing the accumulators acts as a counterpoise to the load, thus reducing to a minimum the effort required to lift the drum clear of the ground, and enabling this task to be carried out by a motor of comparatively small size. The weight of the drum is carried immediately over the back wheels. The driving platform is arranged so that the truck can be driven in either direction. The vehicle is equipped with two brakes of the internal-expanding pattern, one hand and one foot operated, both being interlocked with the controller by the makers' special electric trip gear. The truck can also be used, it is claimed, for the laying of cables.

A New Electric Fire.

A recent addition to the products of THE BASTIAN METER CO., LTD., 58, Haymarket, London, S.W.1, is the "Super Imp" electric fire, which has been designed so that the reflectors throw the heat not only straight forward, but also in a downward direction to the floor. Two Quartzalite elements, each consuming 1 kWh per hour, glow at a bright red heat, giving a cheerful effect and a near approach to a hot coal fire. A further advantage is that a kettle can be boiled readily, and if by chance it boils over, the water falling on the elements, it is claimed, will not damage them in any way.

Electric Railway Track Equipment.

A Comparative Review of the Electrical Apparatus installed on the London Underground Lines, and Experience Gained in their Operation.

By ARTHUR R. COOPER, M.I.E.E.

(*Abstract of a paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE paper describes generally the lay-out of the electrical track equipment of the London Underground Railways, including the District, London Electric, Central London, and the City and South London Railways, and deals particularly with the adoption of the insulated-return system, the conductor rails, insulators, h.p. cables, and other parts of the equipment.

The earlier tube railways adopted the earthed-return system, the track rails being used for conveying the current back to the sub-station. The electrification of the District and Metropolitan Railways was carried out with an insulated return, a fourth rail being provided. Undoubtedly the chief feature determining the decision to adopt this system was the possible injurious effect on the apparatus of public supply undertakings and, in particular, the Government observatories, from earth currents.

The decision to have an insulated return was influenced by the situation and construction of the District Railway. The tracks were near to the surface, and therefore to such outside interests as cables and pipes. The railway was not surrounded by a cast-iron lining as on the tube railways, and track-circuit signalling, employing d.c., was to be installed, making it difficult to use the track rails for the return traction current; it was also claimed that the insulated return allowed the railways to continue working if one pole became earthed due to failure of its insulation, and cases have occurred where for many hours the system has operated with the positive conductor earthed. The general supposition that the use of track rails for return traction current is much cheaper than the installation of a fourth rail for the insulated return is not necessarily correct where track circuits are employed for signalling purposes, and where the signalling installed has to provide for a very close headway of trains. The use of track rails for both traction and signalling current renders impedance bonds necessary for the separation of the a.c. signalling sections. The cost of the electrical equipment of the track with an earthed return and track circuits is about the same as the cost of the electrical track equipment for an insulated return system where the track has to deal with a close headway of trains, necessitating nine signalling sections per mile.

It is improbable that there will be any further adoption of the insulated return except for extensions to existing lines. In working the railways with an insulated return, certain effects have been encountered which were not anticipated when the system was adopted. It will be realised that if there is a short-circuit between the positive side of the low-pressure system and earth, the potential of the negative side of the system becomes 600 volts below earth. The amount of current that can flow through the positive short-circuit is limited by the leakage of the whole of the negative side of the system, and in consequence, although the current flowing through the positive short-circuit may be appreciable, it will probably not be sufficient to open the circuit breakers in the sub-stations, and the fusing at the positive fault will continue until either the cause is removed or a breakdown occurs on the negative side. This form of failure usually accompanied, or had the result of causing, breakdowns of the insulation at other parts of the system, such as the earthing of a train equipment, not infrequently at a distance of several miles from the original positive short-circuit.

It was difficult to account for the failures resulting from the original positive short-circuits, but investigation went to show that pressures above 600 volts must be present, apparently due to the sudden interruption of heavy currents flowing over considerable distances. A series of tests was made on the District Railway during non-traffic hours on the effect of the sudden interruption of large currents flowing along considerable lengths of conductor and track rails, and also on the use of various protective devices installed to prevent rises of pressure.

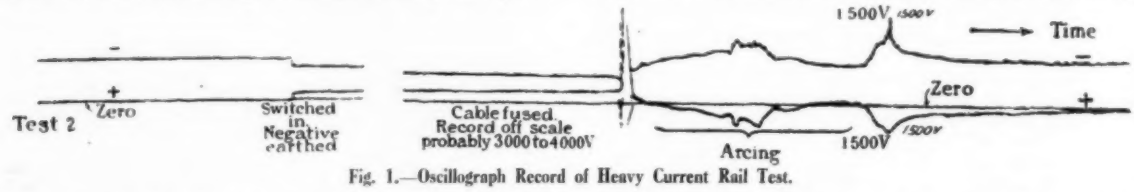


Fig. 1.—Oscillograph Record of Heavy Current Rail Test.

An oscillograph was connected between each conductor rail and earth, the connections being made to the positive and negative bus-bars at the East Ham sub-station. The iron framework of the sub-station building was used as the earth, and the resistance of each of the oscillograph circuits was 10,000 ohms; and they thus constituted a leak of this value between each of the conductor rails and earth. The sensibility of the oscillograph was adjusted so that 1 mm. = 60 volts. The records were made on kinematograph film travelling at approximately 6 in. per second. Three sub-stations, South Kensingfon, Victoria, and East Ham, each had one rotary connected. The positive conductor was earthed at Sloane Square and the records were made at East Ham.

In one test the positive conductor rail was joined to the track at Sloane Square; the negative conductor rail was joined to the track rails at East Ham in the train section with two 7/22 wires. Victoria, South Kensington, and East Ham sub-stations were on the line. The train section was switched in, causing an earth on the lighting circuit at East Ham, which brought out the lighting circuit breaker.

The commencement of the record, fig. 1, shows the positive conductor rail at earth potential and the negative at full-line voltage above earth. At the moment of switching on, the negative potential dropped and the positive rose slightly. As the resistance of the two wires increased, the negative voltage dropped and the positive rose until the cable suddenly fused, causing both lines to shoot right off the film. Following this, arcing appears to have taken place, after which the conditions settled to normal again. It is impossible to say exactly what the maximum voltage obtained may have been, but judging from the appearance of the lines on the film, I should think it could not have been

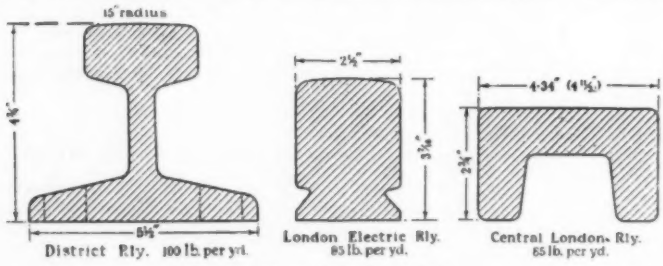


Fig. 2.—Types of Conductor Rail.

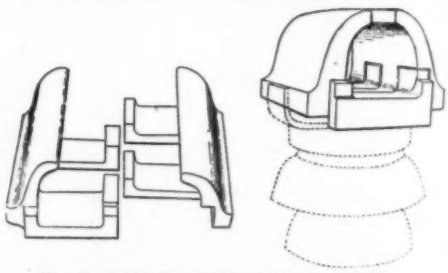


Fig. 3.—Chair for Old Track Conductor Rail.

less than 3,000 or 4,000 V at the moment of the fusing of the cable, and it was in the neighbourhood of 1,500 V at the point where the arc went out.

Certain steps have been taken to deal with this particular class of breakdown, in the first place by sectionalising the l.p. network, so as to lessen the likelihood of failure, and secondly by providing means whereby the current can be removed from the defective section at a moment's notice. As a first step, the District Railway was separated from the tube lines by dividing the sub-station bus-bars in joint sub-stations. Later the tube lines were divided. A series of lamps with the middle point earthed is provided in the traffic controller's office for each of the lines, and the presence of an earth on either the positive or negative side of the system is indicated by a change in the brilliancy of the lamps. Recording voltmeters are installed at a few places to record the voltage between the negative and earth, and are placed in such positions as to be frequently under observation.

The types of conductor rail installed on three of the railways are shown in fig. 2. One of the reasons for the adoption of the rectangular rail on the London Electric Railways is the small amount of space available for the positive rail

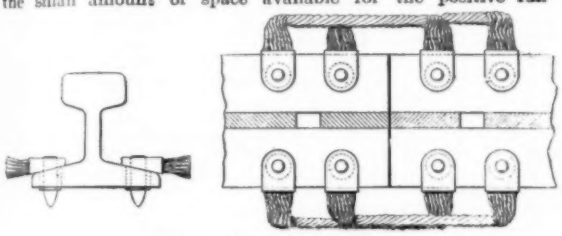


Fig. 4.—Present-Day Bonding.

in the tubes. Special soft steel containing about 0.08 per cent. of carbon is used for conductor rails, this having a resistance about seven times that of copper of equal cross-sectional area, or approximately 0.03 ohm per mile for the 100-lb. rail. A low manganese content in the steel is also necessary; in fact, it can be said that a maximum of iron and a minimum of the other constituents is required to obtain high conductivity.

The necessity for good conductivity deserves more attention than has been given to it. The resistance of individual rails in a consignment varies not infrequently from 6½ to 7½ times the resistance of copper by volume. It is difficult to explain what brings about such variation of the resistance, and chemical analysis has not made the reason clear. It is probable that the exercise of special care in the manufacture of the material, *e.g.*, in the temperature of rolling, would enable a better conductivity to be obtained. Commercial pure iron can be obtained having a resistance of about 6.2 times that of copper. This improvement of some 15 per cent. in conductivity, however, involves 30 per cent. extra cost, so that in situations where only conductivity is concerned, it is clearly cheaper to obtain greater conductivity by the adoption of heavier ordinary rails.

The flat-bottom rail allows of a better alignment at the joint, due to the provision of fishing angles, and is less liable to overturn; the bonding is also easier to arrange. On the other hand, it exposes a large surface for corrosion. The rectangular section would at first sight appear to be easier to roll, but the groove provided for fishing purposes does away with the otherwise simple section. The channel-section rail is more stable in position than the rectangular one, but its supports and connections are not so readily inspected, and bending is more difficult.

Old running rails, bull-head section, have been used as current rails in sidings and other places, where conductivity is of little account, with the object of lessening the cost. The rails are held in position by a special cast-iron chair, fig. 3, made in two sections, which rests upon an ordinary negative or short insulator for the positive rail, a specially low insulator being used for the negative. The two halves clamp over the two sides of the rail and automatically interlock when in position. The rail is placed head downwards, as the bottom of an old track rail provides a better surface for the shoe. The conductivity of the current rails is measured annually between the sub-stations by connecting through the adjoining tracks at those points and passing a test current through the rails. Tests on the track are carried out on any section length where the conductivity is less than 95 per cent. of that of a continuous rail, due allowance being made for the reduction of the cross-section of the rail by corrosion and wear. The tests on the track are first carried out by sectionalising the rail at cross-overs and other convenient gaps, and finally at individual bonded joints.

The instrument used for testing individual joints is arranged to measure the voltage-drop along a yard length of conductor rail containing the joint, and in comparison at the same instant the drop along an adjoining yard of rail, which naturally does not contain a joint; this comparison forms a measure of the efficiency of the bonded joint. In some cases the bond conductivity has been found to be as low as 80 to 85 per cent. of that of a continuous rail, but a figure less than 95 per cent. is now exceptional.

Pin bonds are used throughout the Underground Railways, the head being drop-forged to the cable connection, and a steel pin being driven in to expand the head in the hole of the rail. Originally two short bonds and two long ones per joint were installed, but the breakages of short bonds were very heavy. Bonds of the same length are used now, arranged as shown in fig. 4. To prevent the collector shoes bridging across the gap between a live and dead rail, a short piece of track, "train section," is provided between the two sections; this is a little longer than the longest train and separately fed from the sub-station bus-bars. The "train section" is switched off from the sub-stations whenever the adjoining section is made dead for any purpose. The present practice on new lines is to fit a special "gap" indicator a few feet in the rear of the actual section gap, the latter consisting of a piece of hard-wood, 2 ft. long. The indicator is a light signal of a special type, normally being extinguished; but when the section ahead is for any reason dead, three small red lights are automatically shown, notifying the driver that it is dead.

Protection against accidental contact with the conductor rails was originally provided by means of wooden creosoted planks secured on each side of the rail. After a time it was decided to remove the inside protection plank, and later still permission was obtained to remove the whole of the protection planking, except at certain places where an outside plank only is now provided.

Separate ramps, 4 ft. long, are provided at the rail-ends where the rails are not continuous, as opposed to turning down the ends of the conductor rails. The cast-iron ramp, fig. 5, whilst introducing another joint, has the distinct advantage, in that it has a wide top surface, of the possibility of the narrow shoes getting down by the side of the rail being materially lessened. The ramps are secured to the conductor rail by fishplates, but are not bonded. They serve for both facing and trailing positions, having a slope of about 1 in 20. Cases have occurred of rails being overturned, due either to atmospheric action pushing the rails out of position, or to defective train shoes getting down by the side of the rail. In several places hard-wood blocks of stout construction have been installed at rail ends, fixed to the sleeper, to break away hanging shoes.

(To be concluded.)

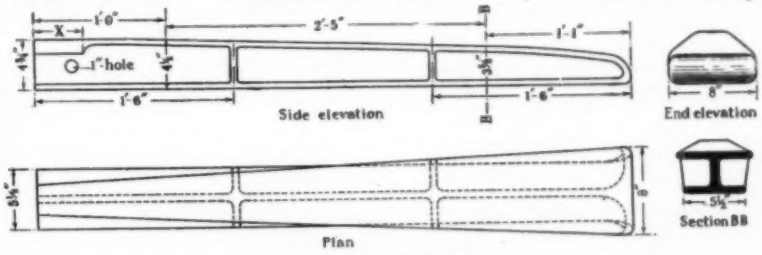


Fig. 5.—Details of Rail-End Ramp.

Discussion.

Mr. ROGER T. SMITH pointed out that the Admiralty clause in connection with the adoption of the third and fourth rails referred to private apparatus at the Greenwich observatory which had since been shifted to the wilds of Kent. He thought that the practice of putting the jumper cables above ground would have the approval of all engineers. The Underground Railways had taken advantage of the unique opportunity of comparing the abrasion in the tubes and in the open. He was particularly interested in the conclusions arrived at to neither clean the insulators nor paint the rails. It was a pity that no illustration was given in the paper of the method of fixing the insulators on the sleepers. Security and ease of maintenance were of the greatest importance on railways, and it would be generally agreed as more important to run the supply cables above ground than buried; but it must be remembered that about 15 per cent. of the carrying capacity of the cables was lost in the former case. Arising out of the 600-V choice was the question of a standard voltage; the arrangement of two current tracks was ideal in many ways, but it must be possible, when main-line electrification came along, to run the trains on all the lines.

SIR JOHN ASPINALL referred to the work of the committee on vibration which laid the blame for vibration on unsprung cars and on the rails. He thought the rails had nothing to do with it. He did not understand the suggestion that vibration accelerated corrosion. He had found that the third rail did not corrode as rapidly as the fourth, due probably to the vibration of the shoe, or perhaps because the third rail threw off the moisture. He suggested that vibration preserved the rails from corrosion. On the Liverpool and Southport railway, which was electrified in 1904, snow cars were sent out each morning in snowy weather, and they had had no trouble. On the Manchester and Bury railway, which was electrified in

1916, they were using 1,200 V, and it was necessary to protect the conductor rail more carefully; a special shoe was employed which fitted over the side of the rail, and no trouble had been encountered with snow. They also had first put the cables in the ground, but had after a few years took them up and put them on posts above ground. He suggested that by employing special rails and tires the Underground Railways could have got over the difficulty of the sharp curves, although this would have been costly. He had found that the effect was worse with the lighter cars.

Mr. G. BROUGHALL said that one reason in support of the third- and fourth-rails system was that it facilitated interconnection. With regard to the voltage surge trouble, he had found it most marked in dry weather. On his undertaking the trouble had been got over by installing electrolytic arrestors in the sub-stations. He had had no difficulty in getting rails of higher conductivity than those referred to by Mr. Cooper. He had found the use of the short bonds quite satisfactory if proper attention was given to the rail joints. The practice on his line was to anchor the rails every 100 ft. He favoured the use of ramps, which could be made of scraps of conductor rail.

Mr. R. A. MACMAHON saw a possible objection to arc bonding of the rails if Mr. Cooper's suggestion as to the weakening effect of burns was correct. It was the Swiss practice to arc bond the head of the rail at the side. The conditions on the Geneva-Lausanne line were similar to those on the Underground Railways, but no trouble had arisen from the arc bonding. He had difficulty in understanding the time lag between the faults which arose as a result of the pressure surges. Perhaps the subsequent faults caused secondary surges. Testing for similar conditions on a Paris system had been effected by flashing over on the sub-station rotaries, and the results were in opposition to the suggestion of condenser effect; oscillations did not occur.

Mr. P. BOULTON thought that the surge troubles might be due to the tendency to regard the negative conductor as unimportant. Tests he had carried out on conductor rail showed a resistance of 6.5 times that of copper, and the carbon and manganese contents were only 0.05 and 0.13 respectively. Commercial iron could be obtained at present with a resistance of only 6.2 times that of copper; it would be advantageous to use iron, due to its greater resistance to corrosion. There were also alloy-steels at present available with higher conductivities than those given. The wear on the third rail might be due to the fact that the positive repelled moisture.

Mr. COOPER, in reply, said that the fixing of the insulators to the sleepers was effected by malleable-iron clips secured to the sleepers by galvanised-iron screws. The square composition insulators afforded easier fixing. With regard to vibration, the surface of the track rails was never true, and it had been found that the amount of vibration depended on the speed. Manganese rails gave the best results. There was little wear on the track rails in the early days, due to the soft material which was used for the brake shoes. The discharge devices referred to by Mr. Broughall had been tried, and it had been decided that nothing was to be gained by their introduction. He strongly favoured the use of the giant strain insulator; it was simple and inexpensive. With regard to the suggestion *re* arc bonding, he thought that two important points ought to be considered—the intensive nature of the arc, and the favourable position on the rail at which it was applied. The end of the rail was not subjected to very heavy stresses. He thought that the possible flickering of the shoes on the negative rail on the curves might be the cause of some of the short circuiting.

The Electricity (Supply) Act, 1926.

A Summary of its Provisions.

(*Concluded from page 37.*)

*28.—(1) The Board may issue stock (to be called Central Electricity Stock).

(2) All such stock, and interest thereon, shall be charged on the undertaking and revenues of the Board.

(3) Any stock created by the Board shall be dealt with according to regulations made by the Minister of Transport with the approval of the Treasury.

29.—(1) The Treasury may guarantee the payment of the interest and principal of any loan proposed to be raised by the Board: provided that the aggregate amount of the loans so guaranteed shall not exceed thirty-three and a half million pounds.

(2) Such sums as may be required by the Treasury for fulfilling any guarantees under this section shall be charged on the Consolidated Fund.

(3) The repayment of any sums so issued out of the Consolidated Fund, together with interest thereon, shall be a charge on the undertaking and revenues of the Board next after the principal and interest of the guaranteed loan, and any sinking fund payments for the repayment of the principal thereof.

(5) The Treasury shall so long as any such guarantees are in force, lay before Parliament every year a statement of the guarantees given, and an account of the total sums issued or paid in.

30.—The Board shall prepare an annual statement of accounts, which shall be audited by auditors appointed by the Minister of Transport, and shall be published at a price not exceeding one shilling a copy.

Miscellaneous Provisions.

31.—(1) On a power company commencing to receive a supply of electricity from the Board, the Minister of Transport may revise the maximum prices authorised under the special Act of the company to be charged by the company for supplies, other than supplies in bulk to authorised undertakers, and may revise the standard prices fixed by such Act; on such revision regard shall be had to any change in the cost of electricity to the company attributable to this Act.

(2) Where a special Act authorises such a power company to make good any deficiency in any previous dividends which have fallen below the prescribed standard rate of dividends, the Electricity Commissioners may, by special Order, make provision for the repeal or limitation of any such authorisation.

32.—(1) Where any company, being authorised undertakers and not being a power company, receive a supply of electricity from the Board, the Electricity Commissioners may, having regard to any change in the cost of electricity to the company attributable to this Act, by special order make provision as to the relation between the charges to be made for electricity and the dividends to be paid by the company.

(2) The provisions of this section shall not apply to any London company.

33.—The Board and any Joint Electricity Authority may adopt the provisions of the Local Government and Other Officers' Superannuation Act, 1922.

34.—(1) Where any tree or hedge obstructs the construction, maintenance, or working of any electric line, the authorised undertakers may give notice to the owner or occupier of the land requiring him to lop or cut it, subject to the payment of expenses reasonably incurred.

(2) If within twenty-one days the requirements of the notice are not complied with, the authorised undertakers may cause the tree or hedge to be lopped.

(3) If, within twenty-one days, the owner or occupier gives a counter notice, objecting to the requirements of the notice, the matter shall be referred to the Minister of Transport, who may make such order as he thinks just.

(4) The authorised undertakers shall issue instructions that trees and hedges shall be lopped or cut in a woodmanlike manner, and shall make good any damage done to the land.

(6) Where it is necessary to fell any trees, this section shall apply.

35.—(1) Unless otherwise agreed, nothing in this Act shall affect the powers of a county council to rebuild or repair any bridge upon which any work by this Act authorised shall be constructed. If the county council requires to carry out such works, and it is necessary temporarily to remove mains and other electrical appliances belonging to the Board from a bridge, the Board shall do the work at their own expense. Any dispute shall be determined by an arbitrator.

Amendments of the Electricity Supply Acts.

36.—For section five of the Electricity (Supply) Act, 1919, an amended section is substituted authorising the Electricity Commissioners to constitute electricity districts, to formulate

*The Act, in its final form, was issued last week, and contains two new clauses, numbered 19 and 24. The Sections on p. 37 of our last issue should therefore be renumbered as follows:—For 19 to 22 read 20 to 23; for 23 to 25 read 25 to 27. EDS.

improvement schemes, and to establish joint electricity authorities; and to hold local inquiries and hear representations with regard to the schemes.

37.—A scheme constituting a joint electricity authority may contain provisions for the carrying-out by the authority of any works for the development of the supply of electricity within the district; and for the subsequent alteration of the constitution of the authority.

38.—The power under the Act of 1919 to make orders altering previous orders shall include power by such subsequent order to constitute a joint electricity authority.

39.—Where a special order is made authorising a company to supply electricity, and the area of supply includes the whole of the districts of two or more local authorities:

(a) The purchasing authority may within six months after the expiration of a period of fifty years from the date of the confirmation of the special order, or such shorter period as may be specified, and within six months after the expiration of every subsequent period of ten years, by notice in writing require the company to sell their undertaking upon the payment of a sum equal to the capital properly expended on land, buildings, works, material, and plant in use or available at the time, less depreciation according to such scale as may be determined by special order:

(b) The Minister of Transport shall determine any questions which may arise.

(c) The purchasing authority—

(i) where the area of supply is situate wholly or mainly within the district of a joint electricity authority, shall be the authority: Provided that, if the area is situate partly within the district of one joint electricity authority any partly in that of another, the right of purchase shall be exerciseable by one of those authorities, or shall be divisible between them, as the Electricity Commissioners may determine;

(ii) in any other case, shall be the local authorities for the districts in which any part of the area of supply is situate, acting through a joint committee or joint board.

(d) Sections two and three of the Electric Lighting Act, 1888, shall not apply.

40.—Where a company, being authorised undertakers, have ceased to generate electricity, and are taking a supply in bulk from the Board, or from any other source, and the undertaking of the company is purchased by a local authority, in addition to the sum payable to the company under the Act of 1888, or any local Act or Order, there shall be paid a sum representing the capital properly expended upon plant rendered unsuitable for use by reason of the taking of bulk supply, after deducting such amount as the company, in the opinion of the Electricity Commissioners, ought properly to have written off. Any question arising under this provision shall be determined by the Electricity Commissioners, whose decision shall be final.

41.—Where any right to purchase the whole or any part of an undertaking is vested in a local authority (including a joint electricity authority), the authorised undertakers may at any time within ten years before the date of purchase enter into a contract with the local authority to alter the terms of purchase upon conditions to be agreed between the parties with the approval of the Electricity Commissioners.

42.—(1) The charge made to any ordinary consumer may consist of a periodical fixed or service charge and in addition a charge for the actual quantity of energy supplied, or for the electrical quantity contained in the supply. The fixed charge may include rent in respect of any meter and any electric lines, fittings, apparatus and appliances provided by the undertakers on the premises of the consumer, whether let on hire or hire-purchase terms to the consumer or otherwise.

43.—(1) The Schedule to the Electric Lighting (Clauses) Act, 1899, and similar provisions, shall have effect subject to the amendments specified in the Fifth Schedule to this Act.

44.—(1) Where applications for consent to the placing of an electric line above ground and wayleaves have not been agreed with the owners or occupiers of any land proposed to be crossed, the undertakers may serve notice of their proposal, and the Minister of Transport may proceed concurrently, under sections twenty-one and twenty-two of the Electricity (Supply) Act, 1919.

(3) Where an application has been made for consent to the placing of an electric line above ground, and representations are made that the line will prejudicially affect any ancient monument, shall take into consideration any recommendations made to him by the Commissioners of Works.

45.—Expenses reasonably incurred by authorised undertakers in reconnecting any electric line which may have been lawfully cut off by default of the consumer may be recovered by the authorised undertakers.

46.—The owners of any railway generating station may supply electricity therefrom to the owners of any other railway generating station upon agreed terms and conditions, with the consent of the Electricity Commissioners, who may authorise the breaking-up of roads, &c. The provisions of the Electricity (Supply) Acts, so far as they relate to the protection of the Postmaster-General, shall apply to any works for the supply of electricity under this section.

47.—Authorised undertakers may supply electricity for traction to the owners or lessees of a railway, dock, harbour, or canal undertaking situate partly within and partly without their district, subject to the consent of the Minister of Transport, for any purposes of such undertaking, whether within or without the district or area of supply.

48.—(1) Subject to the provisions of this section, a joint electricity authority and any local authority authorised by special Act or by Order to supply electricity may sell electric lines, fittings, apparatus, and appliances for lighting, heating, and motive power, and for all other purposes for which electricity can or may be used (in this section called "electric fittings"), and may install, connect, repair, maintain, and remove the same, and with respect thereto may demand and take such remuneration or rents and charges, and may make such terms and conditions as may be agreed upon.

(2) The exercise of the powers of this section shall be subject to the following restrictions:—

(a) The joint electricity authority or local authority shall not manufacture electric fittings unless expressly authorised to do so by special Act or Order;

(b) The joint electricity authority or local authority shall not sell electric fittings except—

(i) to a consumer or a person who intends to be a consumer of electricity supplied by them; or

(ii) to a contractor who requires such fittings to enable him to supply them to a person who is, or intends to be, a consumer of electricity supplied by the joint electricity authority or local authority;

(c) The prices charged by a joint electricity authority or a local authority for the sale of any electric fittings shall not be less than the recognised retail prices, unless the sale is to a contractor, in which case the prices shall not be less than the recognised trade prices, and if any question shall arise as to what are the recognised retail or trade prices of any electric fittings, that question shall be determined by the committee appointed as hereinafter provided;

(d) Every such joint electricity authority or local authority shall so adjust the charges to be made by them under this section as to meet any expenditure incurred by them in the exercise of the powers of this section (including interest upon and sinking fund charges in respect of money borrowed for the purposes of this section);

(e) The total sums received and expended by any such joint electricity authority or local authority under this section in each year, including interest upon and sinking fund charges in respect of money borrowed for the purposes of this section, shall be shown separately in the published accounts of the electricity undertaking of such joint electricity authority or local authority.

(3) The Electricity Commissioners shall appoint a committee comprising representatives of associations representing local authorities who are authorised undertakers, contractors, and persons engaged in the business of making and persons engaged in the business of selling electric fittings, such committee to be appointed after consultation with those associations, and that committee shall determine any question which may be raised under this section as to the recognised retail or trade prices of any electric fittings and shall advise and assist the persons concerned as to the method of giving effect to the provisions of this section.

(4) The purposes of this section shall be deemed to be purposes for which the joint electricity authority or the local authority may borrow money.

(5) In this section the expression "contractor" means a person engaged in the business of selling and installing electric fittings.

49.—Where the owners of a gas undertaking apply for a Special Order, and the Electricity Commissioners are unable or unwilling to make the Order, the Commissioners shall refer the matter to the Minister of Transport, and thereupon the Minister may, if he thinks fit, make the Order.

50.—Minor amendments.

General.

51.—(1) For the purposes of this Act, unless the context otherwise requires—

The expression "generating station" has the meaning given thereto by section thirty-six of the Electricity (Supply) Act, 1919, and not the meaning given thereto by section twenty-five of the Electric Lighting Act, 1909.

The expression "transmission line," when used with reference to a line which is a main transmission line within the meaning of the Electricity (Supply) Act, 1919, shall include all such works as are mentioned in that definition, and, when used with reference to a line which is not such a main transmission line, shall include any works necessary to and used for the control of the transmission line and the transmission of electricity thereby and the buildings or such part thereof as may be required to accommodate those works.

The expression "owners" in relation to a generating station includes lessees or occupiers of the station operating the station.

(3) If the price for a supply of electricity is under this Act to be the cost of production adjusted according to the load factor, the adjusted price shall be the sum of the following items:—

(a) the number of kilowatts of maximum demand in each month of the year of account multiplied by the fixed kilowatt charges component;

(*b*) the number of units supplied to the undertakers during the year of account multiplied by the running charges component.

For the purposes of this sub-section—

The number of kilowatts of maximum demand for any month shall be deemed to be twice the largest number of units of electricity supplied to the undertakers during any consecutive thirty minutes in that month: provided that, if the number of kilowatts of maximum demand so ascertained shall be less than the number of kilowatts of maximum demand in any previous month of the same year of account, payment shall be made on the higher number; and

The "fixed kilowatt charges component" and "running charges component" shall be ascertained in accordance with the rules contained in the Seventh Schedule to this Act.

(4) If the price for a supply of electricity is under this Act to be adjusted according to power factor or otherwise ascertained, such adjustment or ascertainment shall be made in accordance with regulations to be prescribed by the Electricity Commissioners.

(5) Where for the purposes of this Act it is necessary to calculate what the cost of taking a supply of electricity from the Board over a number of years will be, in making the calculation it shall be assumed that the price of fuel and the rates of wages remain constant.

Schedules.

The First Schedule provides that the price of a generating station or main transmission line shall be the amount expended, less depreciation on a scale fixed by special order, and shall be subject to arbitration.

The Second Schedule gives rules for determining the cost of production of electricity at selected stations.

The Third Schedule specifies the authorised charges and allowances in respect of transmission lines used for giving bulk supply to authorised undertakers.

The Fourth Schedule is an adaptation of Section 16 of the Electricity (Supply) Act, 1919, as amended by Section 21 of the Electricity (Supply) Act, 1922, relating to compensation of employés for loss of employment or other injury due to the working of this Act.

The Fifth Schedule contains amendments of the schedule to the Electric Lighting (Clauses) Act, 1899, regarding the disposal of surplus funds, and provides that the amount which may be applied in aid of the local rate in any year shall not exceed one and a-half per cent. of the outstanding debt of the undertaking; and after March 31st, 1930, no sum shall be paid in aid of the local rate unless the reserve fund amounts to more than one-twentieth of the aggregate capital expenditure on the undertaking.

The period of notice of works in streets is reduced, in the case of service lines, to seven days.

The Sixth Schedule contains minor amendments of the Electricity (Supply) Acts, 1882-1922.

The Seventh Schedule gives rules for determining the fixed kilowatt charges component, and the running charges component; the cost of production, ascertained in accordance with the second schedule to the Act, is to be allocated as between fixed costs and running costs in accordance with regulations prescribed by the Electricity Commissioners.

Correspondence.

The "H" Type of Cable.

We are glad Mr. G. H. Nisbett has at last experienced some amusement out of such a subject as super-tension cables. He is apparently anxious to reciprocate and be amusing by indicating to all and sundry that his company has said from its pedestal the last word on this subject. Of course, he is not serious, but the position in which the authorities who have the responsibility of developing electricity supply under the Electricity Act are placed is quite serious, and it must be a matter of some satisfaction to them that there is now available in this country the supply of a super-tension cable which has been proved in many countries on the Continent the most satisfactory three-core super-tension cable to install.

To-day the "H"-type cable holds the field, and one is almost tempted to suggest that some of its detractors are a little bit influenced by "political reasons."

The last word is always with the user, and there is ample evidence that he is by no means convinced that the three-core belted-type super-tension cable supplied in the past, even by such an eminent firm as Mr. Nisbett represents, is a satisfactory job, either electrically or mechanically.

To deal with some of Mr. Nisbett's criticisms of the "H"-type cable from a manufacturing point of view, he says: "If a cable is faulty in manufacture and consequently contains air or vacuous spaces in the insulation" . . . This is evidently written for the benefit of those who are not intimately conversant with cable making. In a properly organised factory, and given the right materials and equipment, with intelligent workpeople, vacuous spaces are hardly possible in the insulated cores. It is on the outside of the cores that these vacuous spaces occur. With the "H"-type cable they can be neglected, but in the case of the belted type they constitute a very serious danger, and even in the case of a perfectly manufactured belted type of cable such spaces would be created by handling during the process of laying. It has been proved beyond doubt that the weakness of the belted-type cable lies between the insulated cores, the belt, and the packings.

The statement that the three-core "H"-type cable is essentially unmechanical because of the absence of a paper binding belt is sheer nonsense, but, in any case, an efficient egg-shaped cable is to be preferred to an inefficient circular product.

Further, the suggestion that the compound used for impregnation will leave the cores to fill vacuous spaces, depends entirely upon the compound used, and the reproduction of the conditions under which impregnation takes place, the latter a very unlikely event; on this point it is interesting to note that the metallised paper used for "H"-type cables admits the impregnating compound through minute apertures under external pressure, and is in itself an important preventive measure against leakage.

We do not share Mr. Nisbett's opinion that "H"-type cable is more costly to manufacture. On the contrary, and in spite of the quite reasonable royalty, we state that its cost is no greater than that of the belted type.

The Macintosh Cable Co. has not decided upon the adoption of the Hochstadter specification without considerable investigation, experiment, and thought for the future.

The Macintosh Cable Co., Ltd.
T. MARTIN-HARVEY, *Managing Director.*

London, *January 3rd*, 1927.

The letter in your issue of the 31st ult. from Mr. G. H. Nisbett, of British Insulated Cables, Ltd., scarcely does justice to the "H" type of cable.

In comparing the respective diameters of the two types of cable, *viz.*, "H" type and belted type, your correspondent assumes that for the belted type the insulation between cores for a 33,000-volt cable is 0.60 inch and 0.35 to earth, whereas the "H"-type cable is to have 0.7 inch insulation between cores, giving also 0.35 inch to earth.

It is not fair to assume that the insulation to earth should be the same for each type of cable, for the insulation in the case of the "H" type is much more evenly stressed and strictly radially, whereas the belted type is subjected to a rotating electrostatic field. Further, with the thickness of insulation given for the belted type, the outer belt is only 0.05 inch in thickness, which one would scarcely describe as "a substantial binding belt," and which would not withstand bending without having torn papers, a few of which would render it useless.

The main fact which the critics of the "H"-type cable are usually pleased to ignore is that whatever the maximum voltage gradient one cares to work to for a belted-type cable, a higher maximum gradient can be worked to for an "H"-type or single-core-type cable with equal safety, entirely on the ground of the even and radial distribution of stress, always assuming, of course, equally good quality of insulation.

I do not agree that the metal screening in the "H"-type cable does nothing to help ionisation troubles. It is well established by experience that single-core cables, although not perfectly impregnated or free from air or vacuous spaces, do not suffer so much as 3-core, belted-type cables from this cause, and that even with the latter type of cable the effects of ionisation are seldom seen in the core insulation, but almost entirely at the boundary of the centre filler where tangential stress is present.

While it is true that the "H"-type cable is a very old device, the reason for its present vogue is not far to seek, and must be well known to your correspondent.

C. Vernier.

Newcastle-on-Tyne, *January 5th*, 1927.

Cablon, Limited, the owners of the "H"-type patent in this country, have, as you are aware, so far made no public announcement of the claims in regard to the merits of this type of cable. The following leading cable makers in this country, namely:—

Callender's Cable and Construction Co., Ltd.
The Enfield Cable Works, Ltd.,
W. T. Henley's Telegraph Works Co., Ltd.,
The Macintosh Cable Co., Ltd.,
Pirelli-General Cable Works, Ltd.,
Siemens Bros. & Co., Ltd.,
Standard Telephones and Cables, Ltd.,

have, after careful research and consideration, applied for and obtained licences from Cablon, Limited, and others have advised us that they are considering applying for licences.

We feel, therefore, that it is incumbent upon us to reply to the criticisms Mr. G. H. Nisbett has made in his letters in your issue of December 31st, and in the issue of the *Electrical Times* of December 23rd.

(1) Mr. Nisbett alleges that the diameter of the "H"-type cable is greater than that of the belt type. This is incorrect. Owing to the better distribution of the electric stress much thinner insulating walls can be used in "H" cables than in belted cables, and as the foil coating only occupies a negligible amount of space any increase of diameter is avoided.

(2) The higher carrying capacity of "H"-type cables is due to their lower thermal resistance. This is brought about partly by the presence of metal paths from the centre of the cable to the lead and partly by the reduced thickness of the insulating walls. The actual superiority of this cable from the current-carrying point of view depends naturally on the thermal resistance of the soil, but in normal ground the figure mentioned, *viz.*, 8 per cent., is a conservative figure.

(3) The "H"-type design (including royalties) does not increase the cost of the cable over that of an ordinary super-tension type, and there are no increased difficulties in drying and impregnating, over and above those ordinarily encountered. On the contrary, the smaller dielectric thickness is more easily penetrated than a thick layer would be.

(4) With regard to Mr. Nisbett's statement that experience has shown that the ratio of power factor relative to voltage is an unreliable index of the dependability of a cable, Mr. Nisbett appears to have overlooked the fact that, apart from the difficulty of producing an approximate constancy of power factor at different voltages in belted-type cables, belted-type cable, after repeated heating and cooling, rapidly loses this property. On the other hand, it is an established fact that "H"-type cables, when built with no more than ordinary care, have initially a closely constant power factor at different voltages, and retain this after repeated heating and cooling.

(5) It has never been contended that "H"-type cable removes all possible difficulties incidental to the use of super-tenson underground transmission. It is, however, proved that the absence of tangential stresses and the lack of need for maintaining anything like perfect homogeneity in the filling spaces constitutes a great advance in the hitherto generally accepted type of cable.

The fact that 26 leading cable makers on the Continent of Europe, in America, and Japan have acquired licences and are successfully making "H"-type cables, and the rapidly increasing demand for "H"-type cable, based on the satisfactory performance of those laid during the past three to four years, are conclusive proof of the merits of the "H"-type cable.

Cablon, Ltd.
W. L. SMITH, *Secretary.*

London, *January 4th*, 1927.

It would seem that some reply is due from us to the three communications in your last issue, in which comment is made on our letter in your issue of December 31st, and we therefore venture again to trespass on your space.

Mr. C. E. Watson accuses us of attempting to silence opposition by making a loud noise, but surely this is an inversion of the facts. Our letter was a mere whisper compared with the trumpeting that the Press has lately allowed to the advocates of the "H"-type cable.

These gentlemen write in such a way as to lead your readers to believe by inference that all the super-tension cable hitherto made has been a failure, and that it is only when they start to manufacture "H"-type cable that the millennium will be reached. Such an impression left unchallenged would do harm to the British cable industry, which has hitherto held such a deservedly high reputation.

Now there are many miles of the belted-type cable that have been at work successfully at 33,000 volts for years, both at home and abroad, and only comparatively insignificant quantities of the screened type have recently been put into service. Such trouble as has occurred with the belted cable has (so far as we know) been confined to abnormal cases of laying or handling, and there is no evidence that the "H"-type cable would have behaved any better under similar circumstances.

Mr. Watson questions our statement that the screened cable is necessarily more costly than the belted, but may we point out that the stresses on the insulation at the point of minimum thickness between any conductor and lead in a three-core cable are practically radial and the same in the two types, so that, making no allowance for the better impregnation of the belted-type cable, and assuming like qualities of material, both types need the same thickness of insulation to earth. The screened type *must* have twice this thickness between conductors, whereas the belted type *may* and does have less, so that the screened type must be the more costly to manufacture.

As to the mechanical weakness of a type of cable involving the use of three heavy insulated cores, necessarily laid up with a long lay and only lightly bound together, then sheathed with a ductile metal such as lead, your readers will be able to judge. Surely if it is a first essential, as seems to be admitted by all parties, that the lead covering shall be as completely filled as possible, it is desirable to see that there is no possibility of the stretching of the lead after it has once been applied.

In answer to our statement that the curves shown in your issue of December 17th are unfair to the belted-type cable, Mr. Watson points out that they do show the comparative values of the two methods of construction. Here we are in some measure of agreement because we readily admit that, with a badly-constructed cable, the use of a core screen will improve the p.f. tests, although we deny that such use will necessarily turn a bad cable into a good one. However, the point we wished to make was that a well-made belted-type cable does not need a screen, at least for working pressures up to 33,000 volts.

In the matter of relative carrying capacity, Mr. Watson claims for the screened-type cable increased heat conduction due to thinner walls, the impossibility of which we have already pointed out; others have claimed the same thing for the metal sheathing, and still others for the absence of ionisation losses. We can only say that all these causes put together only result in a small percentage difference, if the comparison is made between a *good* belted cable and a *good* screened cable.

Mr. G. H. Nash is much more modest in his claims for the "H" cable than are some other advocates, and we are glad to see that he deprecates over-enthusiasm and the claiming of too much. He agrees that the screened cable is more difficult to dry and impregnate, but says the difficulty can be overcome. He admits that the tangential stresses are within the capabilities of a belted cable on first manufacture, but says that they do not remain so in service.

Any deterioration that may occur in a cable after leaving the factory, and during handling, can only come about because of mechanical causes, and certainly a cable with a heavy belt must be less liable to distortion than a screened cable, necessarily practically without one.

Mr. Nash says that the belted-type cable shows a sharp rise in power factor on cooling after a heat run and the "H" type shows practically no change; this is no doubt true for some makes of belted cable, and conversely untrue for some makes of screened cable.

Mr. F. Richardson asks us why we criticise the relative power-factor and voltage curves as published in the ELECTRICAL REVIEW of December 17th, in view of our statement in the *Electrical Times* that power factor relative to voltage is an unreliable index of the dependability of a cable. The answer is obvious, namely, that we were criticising a comparison made by someone else, and, in order to do so, had perforce to accept his premises.

For the rest of his letter, Mr. Richardson contents himself with a general statement somewhat to the effect that anybody who is anybody is making the "H"-type cable, that it has been successfully used for years past, &c.—quite in the best advertising style.

But the facts are: that throughout the world a much greater length of the belt-type 33,000-volt cable is working successfully to-day than there is of the "H" type; that there are in this country belted cables of our manufacture that have been continuously alive for the past five years without a single cable fault; and that many of the more experienced makers of super-tension cables are still manufacturing cables of this type.

We hope the subject matter of our letter will excuse its length.

British Insulated Cables, Ltd.
G. H. NISBETT, *Director and Engineer.*

Prescot, *January 10th*, 1927.

Electric Ovens.

Some little time ago the gas journals announced that electric ovens were being given up in Switzerland, owing to the fact that they generated ozone, which damages bread and pastry. It will be very interesting to hear if any of your readers have information on this subject, as I find that it is of great importance to large users of electric ovens.

Oven.

January 4th, 1927.

The Necessity for Higher Voltages.

I was particularly pleased to have it publicly emphasised at the I.E.E. meeting of December 16th, by an engineer of such reputation as Mr. J. S. Highfield, that higher voltages were bound to come, because the number of cables required to conduct great powers away from the generating station was too serious to contemplate if this were not done.

This is the more gratifying because, about two years ago, I went to the trouble of writing to several of the leading engineers of the country in order to bring home to them that higher voltages were not only necessary when extremely long distances had to be covered, *but also when very large bulks of power had to be transmitted* over what would be considered *short distances.*

The consulting engineers, it would appear, are waiting for the cable makers, and the cable makers hesitate to worry themselves about anything over 66,000 volts so long as they can carry out the great bulk of the distribution work at 66,000 volts.

Now that I have secured such eminent supporters as Mr. Highfield and (I was pleased to note, about a year ago) Mr. Gregory of Newcastle, I feel that I am no longer quite "a voice crying in the wilderness."

A. M. Taylor,
Major, S.O.2.

Birmingham, *January 7th*, 1927.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

ALDERSHOT.—Additional 104 houses, for the T.C.; borough surveyor.

AUSTRALIA (PERTH, W.A.).—Group of buildings for the Administration of Perth University (£150,000).

AYRSHIRE.—Extension of Prestwick Higher Grade School (electric light and central heating); W. Reid, Master of Works, Education Offices, Ayr.

BILSTON.—Kinema, High Street; W. Hurley Robinson (A. Wood's Picture Halls, Ltd.).

BIRMINGHAM.—Year's school programme (£234,000); Education Committee.

BOLTON.—Electric driving plant for screening and salvage plant; Cleansing Committee

BRAZIL.—Press reports state that Platt Bros., of Oldham, and John Hetherington & Sons, of Manchester, have received orders for 100 looms and spinning and other machinery for a new mill in Brazil.

BRANSTON (NEAR BURTON-ON-TRENT).—Artificial silk factory; Rock Investment Co., Salisbury House, London Wall, London, E.C.2.

BRECHIN.—Cinema for Brechin Cinema, Ltd. (heating and ventilation); secretary, 5, Swan Street, Brechin.

BRISTOL.—Palais de Danse, Queen's Road, Clifton; C. F. W. Dening, architect.

BROWNHILLS (STAFFS.).—Isolation hospital, for the U.D.C.; surveyor.

BURNLEY.—Housing scheme (88), Stoops Farm Estate; borough engineer.

CANADA (ALBERTA).—New wing at the Banff Springs Hotel (£300,000).

CARDIFF.—350 houses; city engineer.

CHELMSFORD.—Electricity pumping scheme at swimming baths; borough engineer. Electricity for power at Mills; T. D. Ridley & Sons, Ltd.

CHELTENHAM.—Eighty houses, Hanks Estate; borough engineer.

CHORLEY.—Works, Bolton Road (£40,000), for Leyland Motors, Ltd.

CROMPTON.—Housing scheme (78), Twingates and Smallbrook sites; F. T. Jones, engineer. Town Hall.

DALTON-IN-FURNESS.—Central school; director of education, County Education Offices, Preston.

DERBY.—Large extensions to works for the Combustion Engineering Co. Extensions to Little Chester Sanatorium, for the T.C.; C. A. Clews, borough surveyor, Babington Lane.

DEVIZES.—Additional housing scheme (40), for the R.D.C.; surveyor.

DUDLEY.—Fifty-six houses, Watsons Green; Eadie, Towers and Co.

DUNDEE.—Dispensary for Royal Infirmary (£10,000); R. Still, chairman of directors.

DURHAM.—Boys' central school (£18,000); director of education, City Education Committee.

ECCLES.—Housing scheme (78), Gaskell Road Estate; T. Elce, borough engineer.

EDINBURGH.—Sanatorium for Edinburgh District Board of Control at Bangour (electrical work); J. D. Gibson, surveyor, 60, Frederick Street.

FULBOURN.—Enlargement, Mental Hospital, Cambridgeshire C.C.

GLASGOW.—Electric and steam heating, New Kelvin Hall; city engineer. Garage at Govan (£25,000); city engineer. Extensions Royal Glasgow Asylum for the Blind, Possilpark; governors.

GRAVESEND.—Extension main works; W. T. Henley's Telegraph Works Co., Ltd.

GRAYS.—Cement factory (electrically equipped); particulars from Edgar Allen & Co., Ltd., Sheffield.

GRIMSBY.—Housing scheme (64); borough surveyor.

GUILDFORD.—Houses (100), Curling Vale, for Onslow Village, Ltd.

HALIFAX.—One hundred and seventy-six Corporation houses at Bracewell Farm site, and 116 houses at Nursery Lane; borough engineer, Crossley Street.

HEATH TOWN (WOLVERHAMPTON).—Additional 86 houses, Brickfield Estate, for the U.D.C.; surveyor.

HEMSWORTH.—Forty houses, Grove Lane; U.D.C. surveyor.

HOYLAND NETHER (YORKS).—Housing schemes (88), Hawshaw Lane and Platts Common, for the U.D.C.; surveyor.

HULL.—Two hundred and eighty-two houses, East Hull; F. Bilton. Two hundred and seventy-six houses, North Hull Estate; Fettlewell, Son & Co., Ltd. Isolation hospital, Callingham; city architect. X-ray installation, Sanatorium; medical officer.

INDIA (BOMBAY).—Transmitting station, near Race Course; Indian Broadcasting Co.

IRISH FREE STATE (DUBLIN).—Five hundred and thirty-four houses in Drumcondra and Glasnevin, and 500 in the Kilmainham area; city commissioners. Two schools and church, Fairview (£70,000); city engineer.

(DUNDALK).—Improvements to the port (£50,000) for the Harbour Board.

(LIMERICK).—Docks and wharfages on the River Shannon; secretary, Minister for Industry and Commerce, Dublin.

KINGSBRIDGE.—Cottage hospital; C. E. Ware & Son, Exeter.

KING'S LYNN.—Contract for the erection of beet sugar factory at once has been placed with Fawcett, Preston and Co., sugar machinery manufacturing engineers, Liverpool.

LEEDS.—Electricity for heating and lighting at Killingbeck Sanatorium; medical officer. Tram depôt extensions, Swinegate (£125,000); H. S. Chorley, architect. Eight hundred houses, Tait Estate, and 150 at Mearwood; city architect.

LEICESTER.—Premises, Campbell Street, for W. H. Smith and Sons, wholesale stationers, Strand, London (£10,000 to £15,000).

LONDON (GREENWICH, S.E.).—Concert hall, for the Enginemen and Firemen's Club; E.C. Kelly, secretary, 32, London Street. Heating system at infirmary (£17,000); Board of Guardians.

(BRIXTON, S.W).—Motor coach station, Effra Road; Keith and Boyle (London), Ltd.

(WIMBLEDON, S.W.).—Training college, Belmont Hall; G. E. Withers, architect for Wesleyan Church trustees. Station (£250,000), for the Southern Railway.

(WALTHAMSTOW, E.).—Heating the isolation hospital; U.D.C. medical officer of health.

(EALING, W.).—168 houses; John Laing & Son, Ltd.

MANCHESTER.—Four hundred houses at Burnage for The Phormium Co., of London; city engineer. Boys' municipal high school, Chain Bar, Moston (£60,000); S. Hey, director of education, Education Offices, Deansgate.

MANSFIELD WOODHOUSE.—Sixty-eight houses, Clipstone Road, and Slant Lane; U.D.C. surveyor.

MARKET HARBOROUGH.—Refuse destructor; U.D.C. surveyor.

MORECAMBE.—One hundred and twenty-seven houses; Wm. Gardner & Co., Ltd., builders, Morecambe.

MOTHERWELL.—Re-erection of Dalziel Engineering Works (electrically equipped), for Chambers, Scott & Co., Ltd.

NOTTINGHAM.—Five hundred houses; city engineer.

NORTHOLT (MIDDLESEX).—Estate, development (1,000 houses); Northolt Manor Estates, Ltd.

ORSETT.—School (£13,500); Essex county architect.

PLYMOUTH.—Hospital extension (£260,000); Thornley and Rooke, architects.

PRESTON. — Extensions, Smallpox Hospital; borough engineer.

ROTHERHAM.—300 houses, Meadow estate; borough engineer.

ROWLEY REGIS.—Housing scheme (700), Stile House and Church Farms estates, for the U.D.C.; surveyor.

SCARBOROUGH.—Conversion of Londesborough Lodge into medical baths (cost not exceeding £10,000); borough engineer, Town Hall.

SCULCOATES.—Motive power and stand-by lighting supply; Board of Guardians.

SHEFFIELD.—Kinema, Manor estate; city architect.

SHIPLEY (YORKS.).—68 Council houses at Saltaire; surveyor, Council Offices, Shipley.

SOUTHPORT.—Kinema, Liverpool Road, Ainsdale; Southport Coliseum Co., Ltd.

STOKE-ON-TRENT.—Housing scheme (2,000); city engineer

SUNDERLAND.—Port development; borough engineer.

WATFORD.—Housing scheme (200), Beeches Estate, Borehamwood, for the R.D.C.; surveyor.

WILMINGTON.—Forty houses; Dartford R.D.C. surveyor.